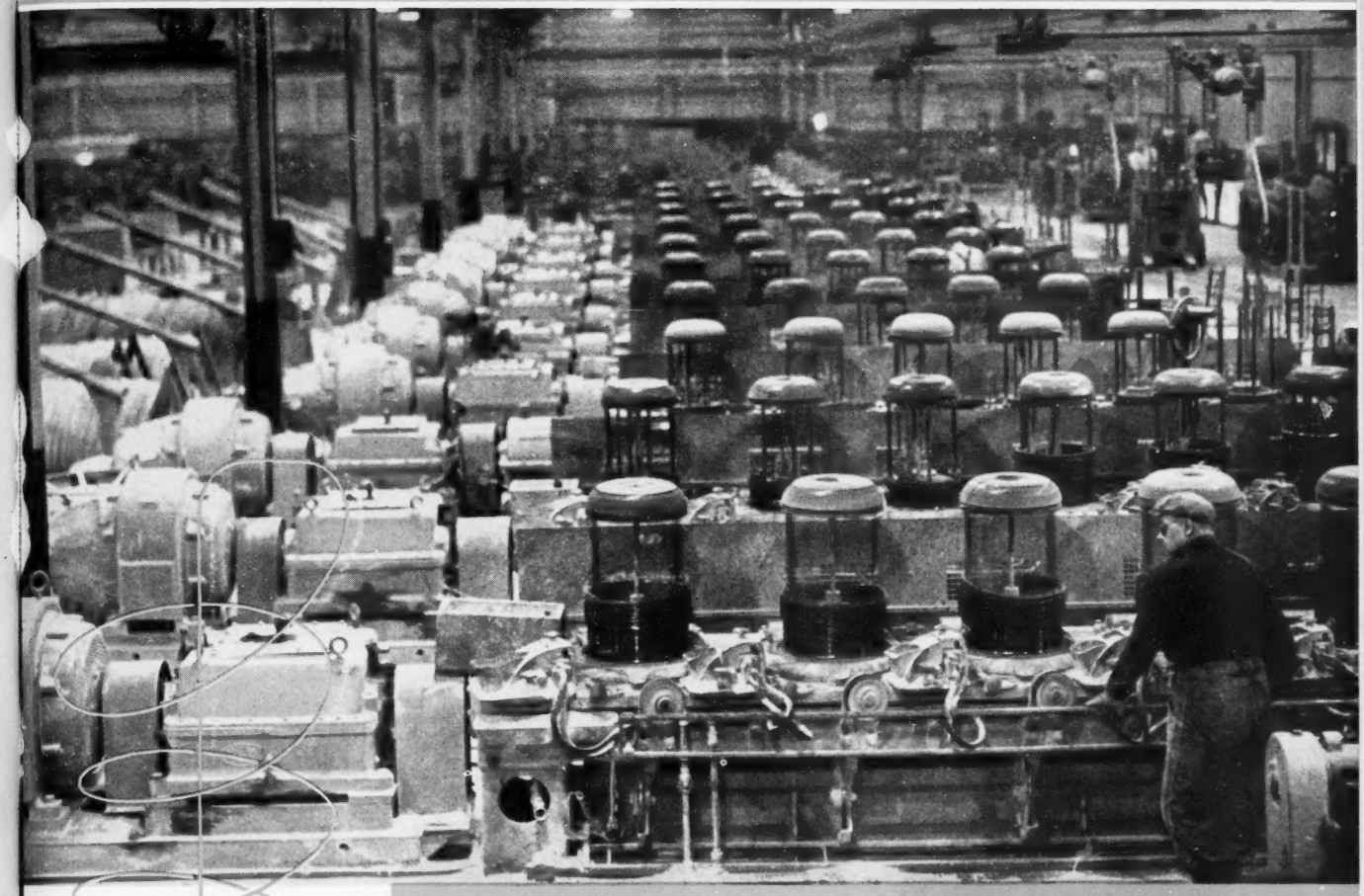
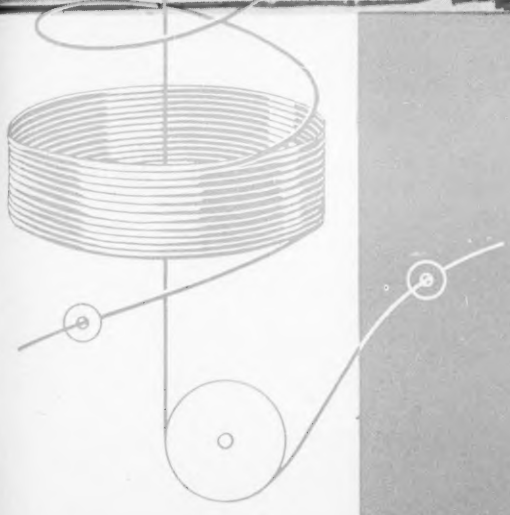
WIRE AND WIRE PRODUCTS

JUNE 1945





MORGAN-CONNOR WIRE MACHINES

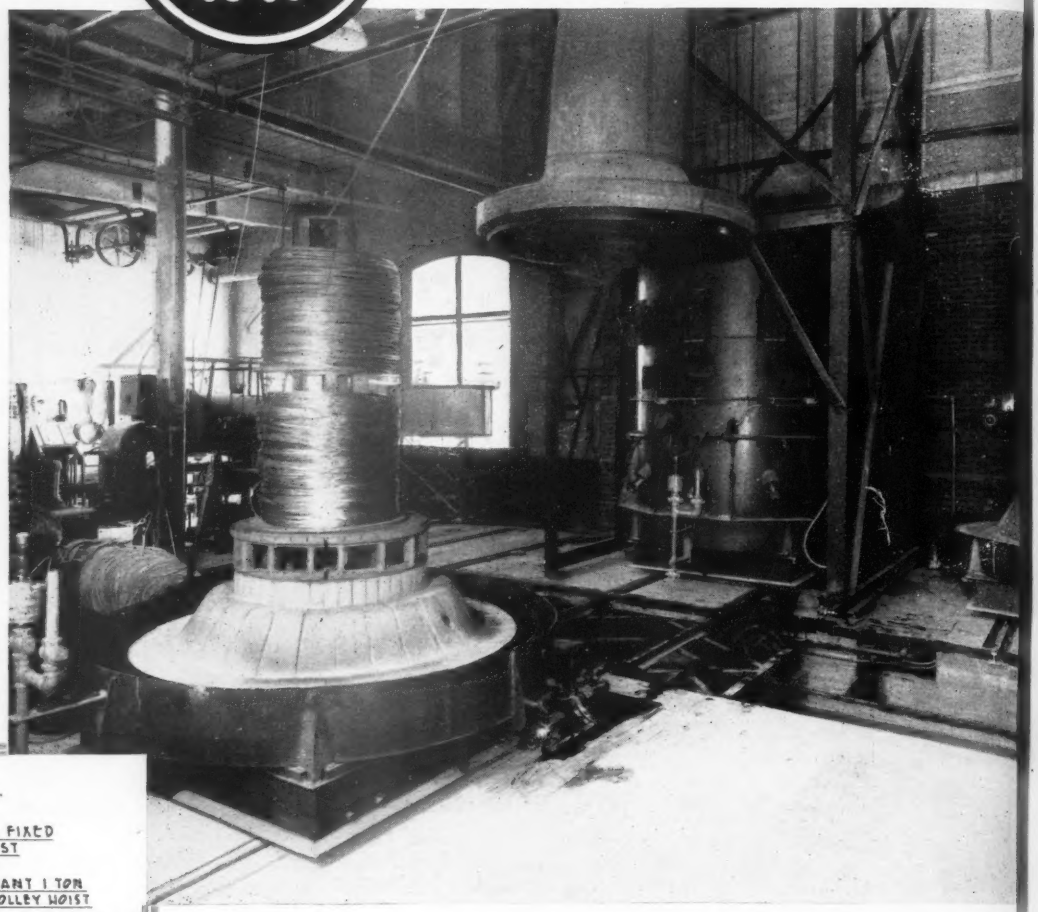
in action

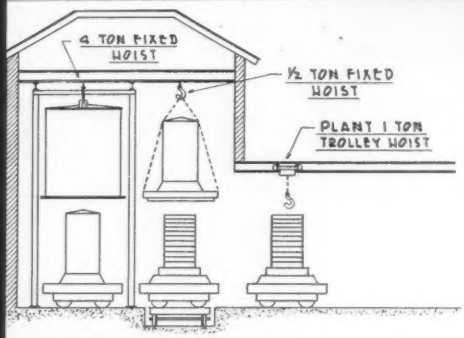
MORGAN CONSTRUCTION COMPANY • WORCESTER, MASSACHUSETT

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

An Unusual WILSON Installation

The Wilson Annealing Unit is covered by Patents Nos. 1,952,402, 2,068,477, 2,078,356, 2,081,612, 2,089,843, and other patents pending.





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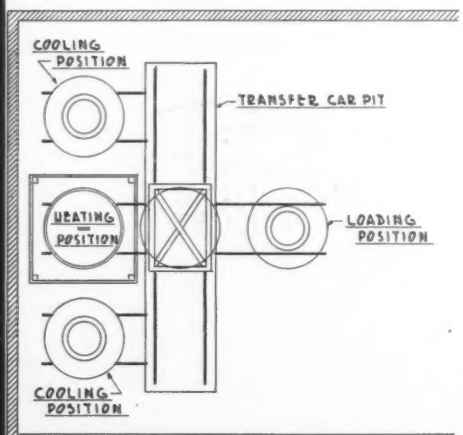

BLDG. PLAN

THIS WILSON Wire Annealing Installation at the Atlas Tack Corp., at Fairhaven, Mass., is designed for plants with small capacity where cranes and building clearances are not available.

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Lee Wilson ENGINEERING Co., Inc.

20005 West Lake Road CLEVELAND, OHIO

Telephone ACademy 4670

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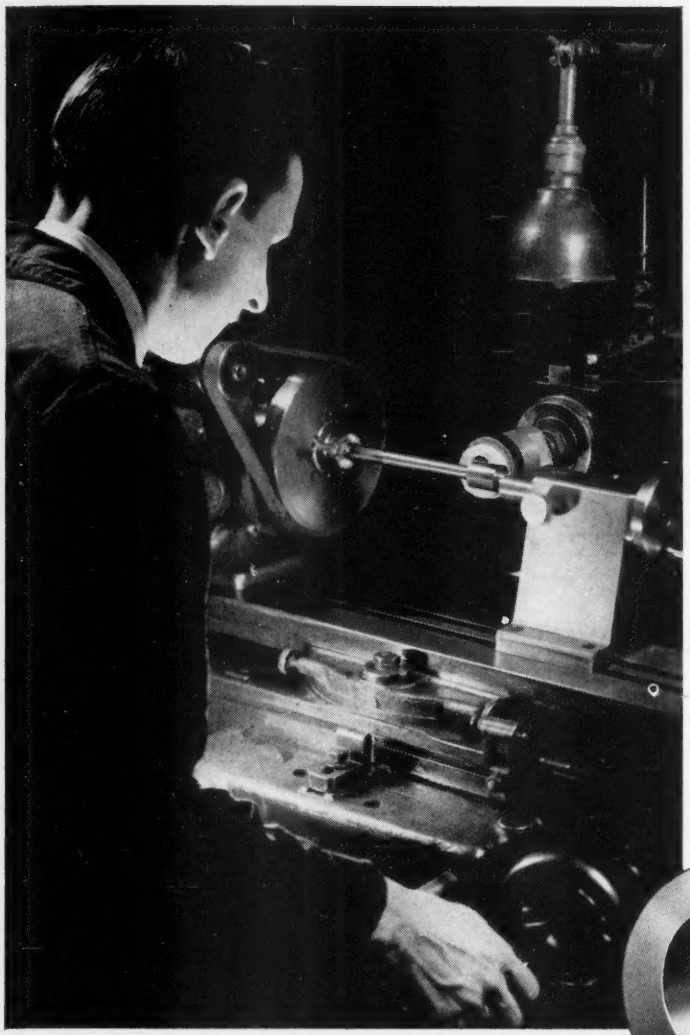

Make your own Carboloy Mandrels

from "cost-saving" rough nibs

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Fast! Economical!

★ Get *all* the benefits of Carboloy Mandrel use—at extremely low investment cost! Make your own mandrels, using Carboloy rough mandrel nibs. With rough nibs in your stock, you are prepared—at minimum inventory expense—to get mandrels on the job *fast* throughout your entire range of sizes.

Made of a grade especially designed for the severe service encountered in tube drawing, Carboloy Mandrel Nibs have the strength to stand up for long periods of operation, *plus* the fine qualities necessary to maintain an extra high quality of surface polish.

Available from stock (see catalog D-114R) in 24 standard sizes to finish at .424" through 2.250". Priced as low as $8.00 each. Other, non-standard sizes made to order.

Carboloy die engineers will be glad to assist you in the training of your die room personnel in mandrel finishing. Our Detroit Die Training Course is also available, without charge, for this activity.

Send for free booklet D-118 on Carboloy Mandrel Use and Servicing.

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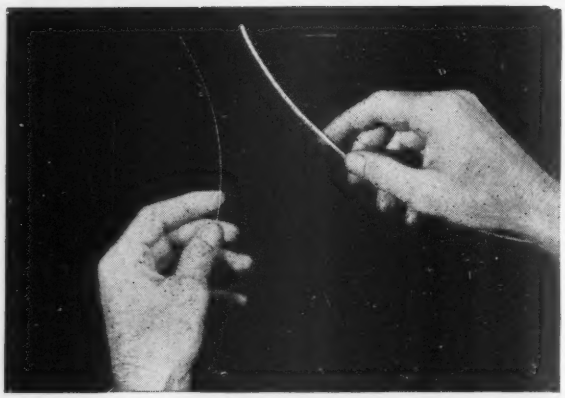

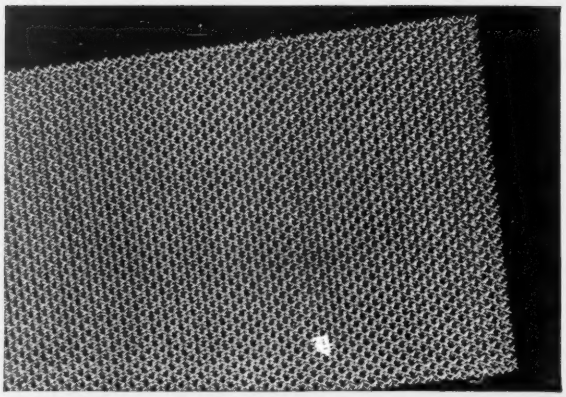

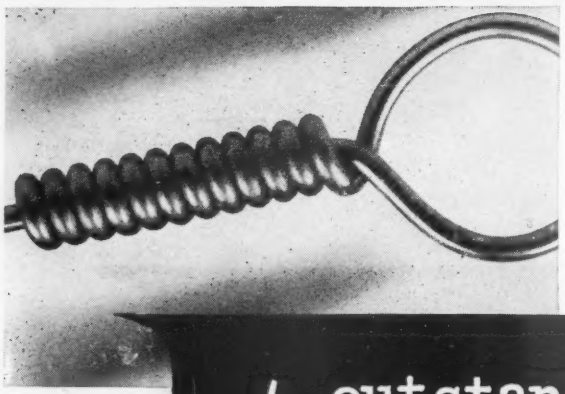

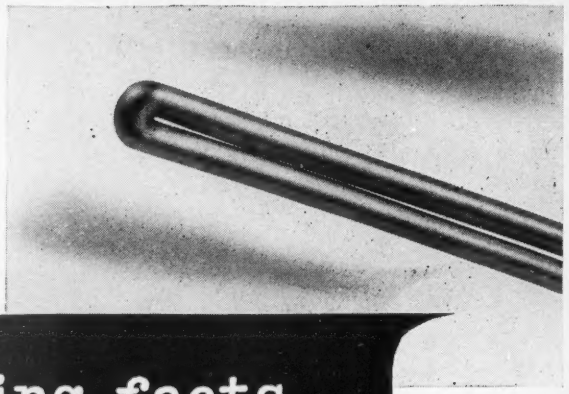

4 outstanding facts about bethanized wire

Without any harm whatsoever to the zinc-coating, bethanized wire can be:

1. *drawn to a fraction of its original size*
2. *wrapped around its own diameter*
3. *bent back flat upon itself*
4. *formed into intricate shapes*

Bethanized wire is able to pass muster after these drastic tests because of the remarkable ductility of the bethanized coating. The bethanized coating is 99.9+ per cent pure zinc, and is applied by an advanced electrolytic process which applies the zinc uniformly both along and around the wire. There are no thin spots in the coating where rust might start.

Because of the purity and uniformity of the coating, bethanized wire is highly resistant to corrosion. For maximum protection where atmospheric conditions are unusually corrosive, coatings can be used two and three times as heavy as those specified for conventional Type 3 galvanizing.

Enormous quantities of this versatile zinc-coated wire are today providing strength-building sinews for assault wire, armoring submarine cables and performing hundreds of other war-related tasks. Many of the applications of bethanized wire had previously been thought impossible for any zinc-coated wire.

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BETHLEHEM STEEL

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for Many of Your Roll Grinding Jobs

FOR the regrinding of hot mill rolls and for the finish grinding of cold mill rolls Norton resinoid bonded wheels are outstandingly popular. Norton research has developed for each job just the resinoid bond formulas necessary for proper grinding action. The resinoid wheel for the regrinding of chilled iron hot mill rolls, for example, has a smooth grinding action that produces a chatter-free surface. For the mirror finish on cold mill rolls there are fine grit Norton resinoid wheels — made of Crystolon abrasive for producing a black surface and of Alundum abrasive when a gray color is preferred.

Norton abrasive engineers will be glad to study all of your roll grinding jobs and recommend the proper wheels—whether resinoid, vitrified or shellac bonded; Alundum, 38 Alundum or Crystolon abrasive.

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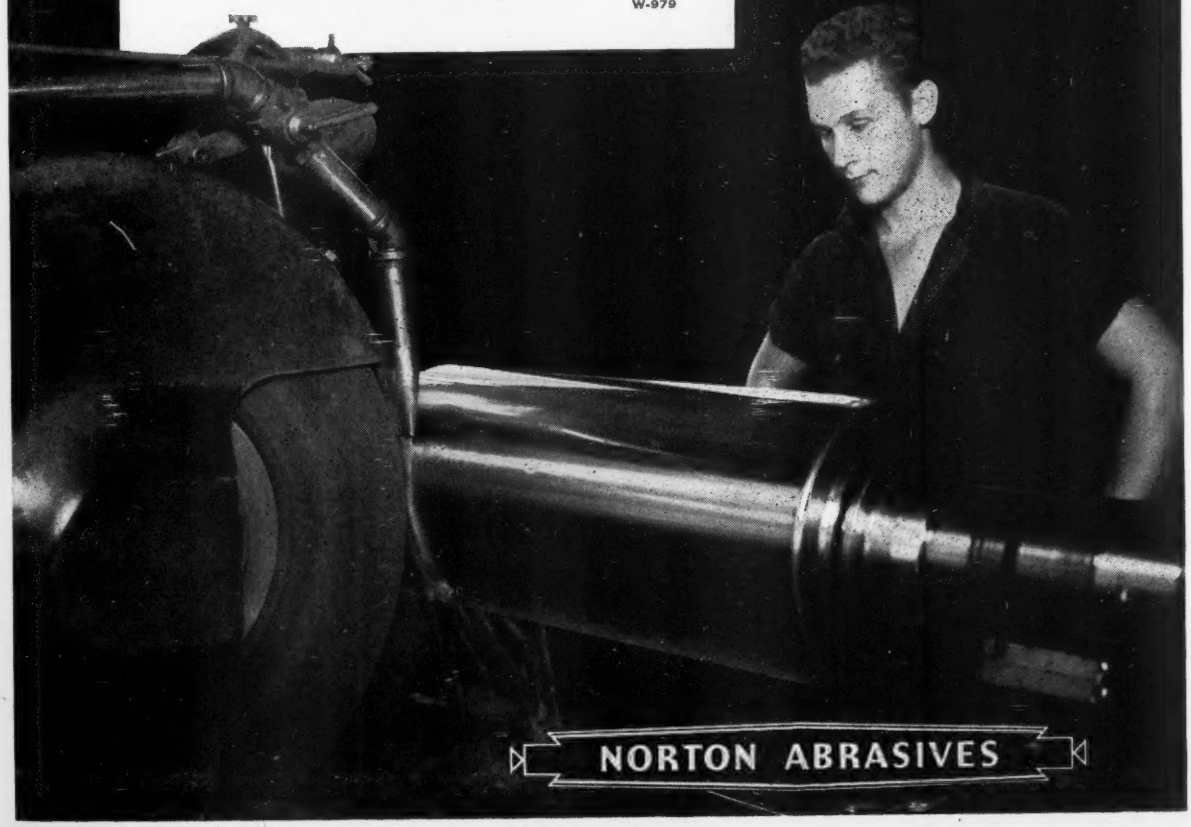

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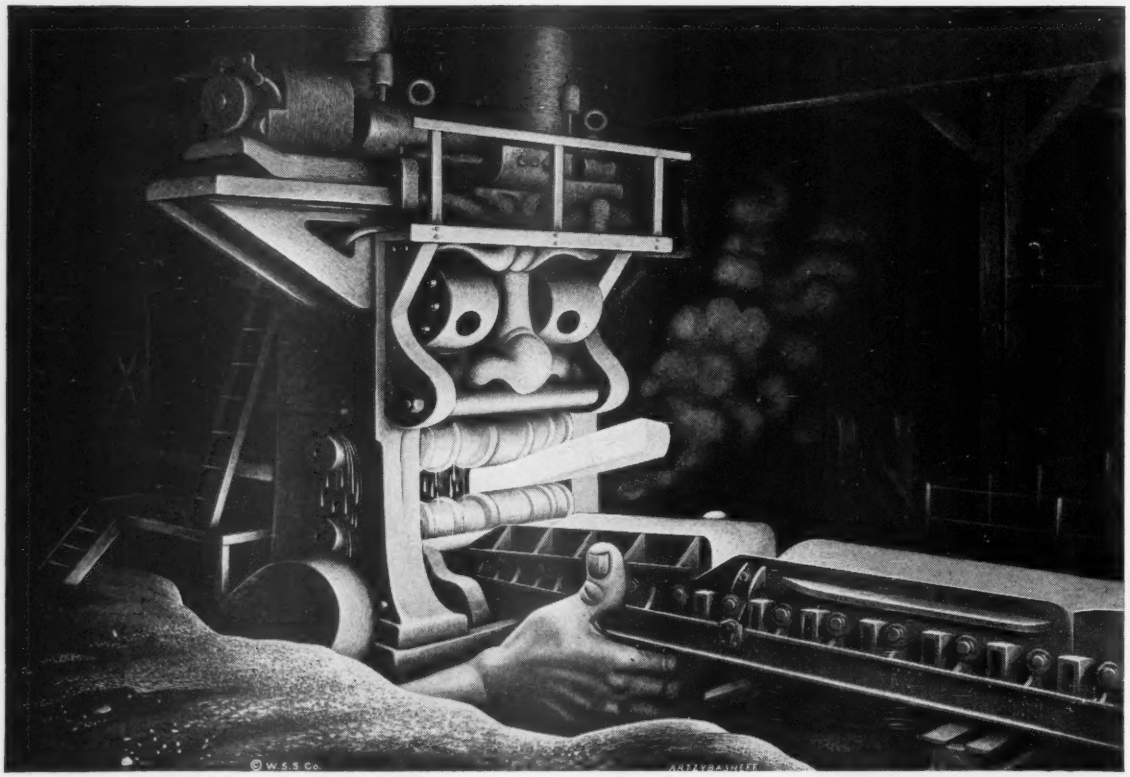

Fifth of a series of Artzybasheff's impressions of the manufacture of steel wire products

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PASS THE INGOT

Here is an ingot at the second "pass"—the second of about twenty trips through the rollers of a giant mill that squeezes and lengthens the hot steel mass until it becomes a bloom.

The process calls for skill of the highest order. For unless the steel is rolled to exact specifications defects may result which will affect the quality of the finished product.

That's why we at Wickwire exercise complete control over our wire products. We operate our own open hearths and modern wire drawing mills, enabling us to meet your exact specifications. Control is important because wire must be uniform in size, tensile and stiffness if it is to by-pass trouble on your wire-working machines.

Our metallurgists will be glad to cooperate in the solution of your wire problems. They will note carefully the way in which the wire is to be used and determine service requirements. Then they'll prepare the exact formula and check every detail to make sure you get high performance at low cost.

Everything you need in steel wire is here at Wire Headquarters in a wide variety of sizes, tempers, grades and finishes—high or low carbon; round or shaped.

Send your wire questions to

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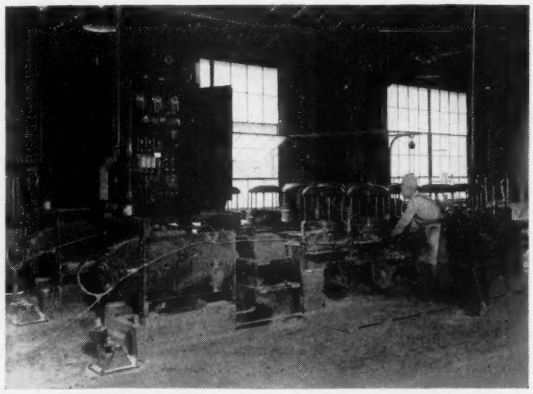

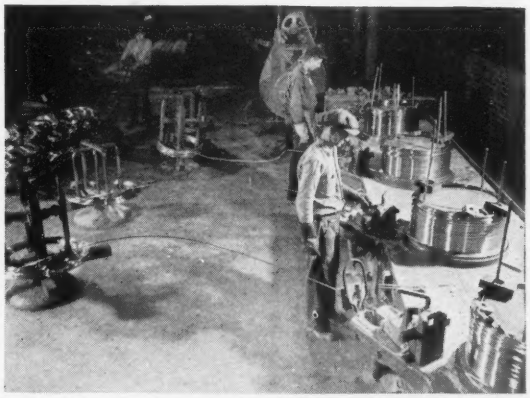

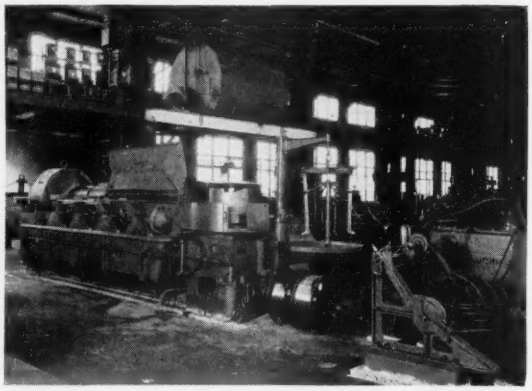

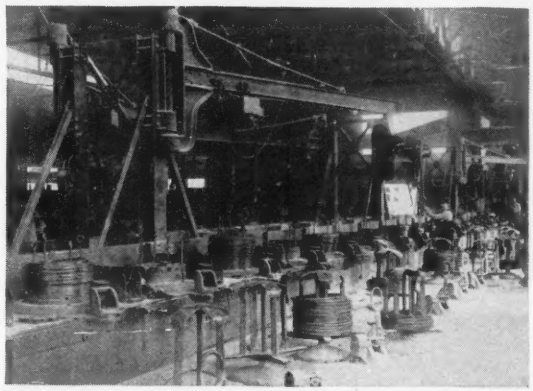

Complete Wire Lubrication for any Mill

WITH the formulas listed below any finish may be produced with highest production per die, and high speed without interruption or tieup in your schedule.

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No. 108 for extra bright finish on three holes or more at high speed.

No. 91 for regular wire finish or nails, or rod breakdown on either high or low carbon.

No. 50 for hard finish on spring wire.

No. 55 or No. 3 for intermediate processing on patented or annealed stocks.

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WELD-COTE—to coat bare metal and prevent scaling.

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Not mass-produced, but practically TAILORED for the particular job required.

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THE NEW JLE AUTOMATIC REELER

TYPE MCW — CONSTANT WIRE SPEED
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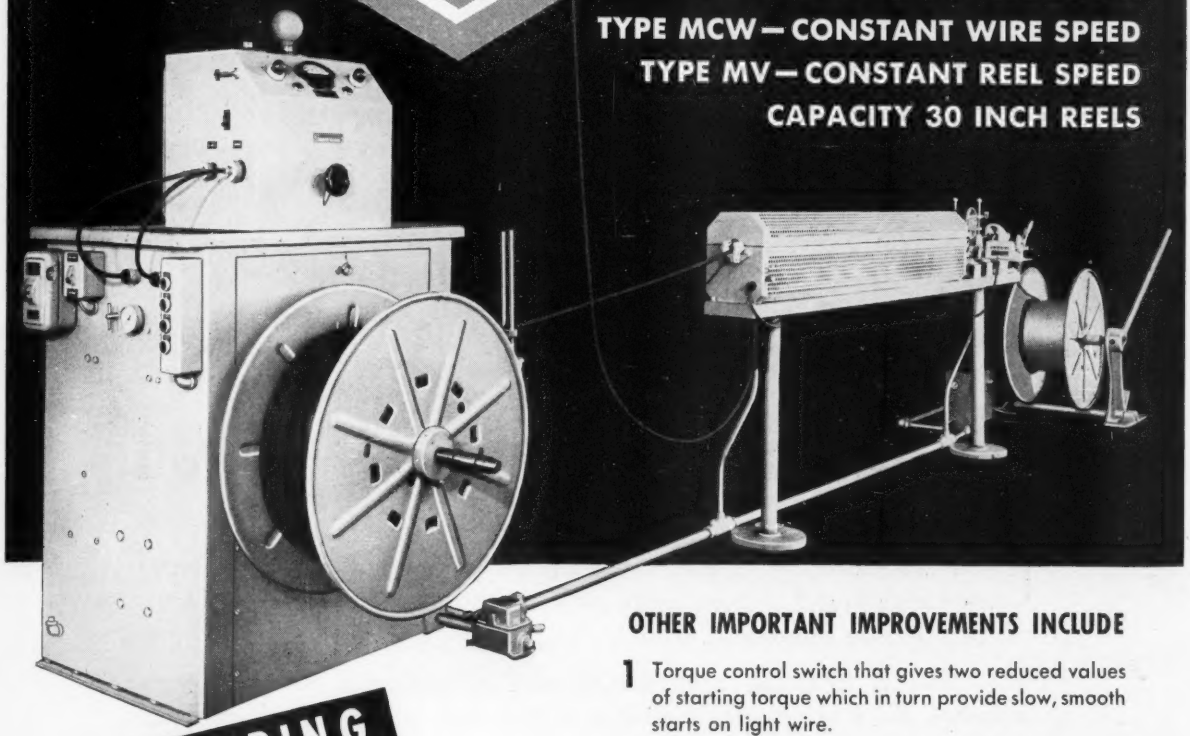
CAPACITY 30 INCH REELS



FEATURING

JLE **TYPE MCW** — Constant Wire Speed variable from 650 to 1950 F.P.M. can be maintained over the full range of reel build-up.

JLE **TYPE MV** — Constant Reel Speed variable from 100 to 300 R.P.M.

JLE **ALL TYPES** — V-Belt Drive throughout, eliminating gears in main drive.

JLE Traverse Variable for wire size and width of reel.

JLE Air Brakes on main (reel) shaft. No braking done through belts or gears.

OTHER IMPORTANT IMPROVEMENTS INCLUDE

1 Torque control switch that gives two reduced values of starting torque which in turn provide slow, smooth starts on light wire.

2 Air Brakes on Reeler and also on Pay-Off Reel Stand give smooth stops without strain on wire. Brakes are easily adjustable and are provided with a gauge permitting predetermined values to be readily duplicated.

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Both coarse and fine adjustments are provided for various reel widths. Traverse reset button allows traverse bar to be moved to start wire at side of reel. Traverse cannot jam due to over-travel.

The new JLE Automatic Reelers form a part of the complete JLE sets of Automatic Spark-Testing, Measuring and Reeling equipment for testing or locating insulation faults for repairs.

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of the opportunities ahead

IT will take hard fighting to crush the Japs, but now that Germany has surrendered, a constantly increasing volume of American production will be channeled into reconstruction and civilian activities.

This is both an opportunity and a challenge for the Wire Industry. An opportunity because of the vast quantities of wire and cable needed, and a challenge to produce high quality products at low cost—which is essential to continuing prosperity and re-employment of our returning veterans.

Syncro "Visioneers" can help you to grasp this opportunity and meet this challenge. As a result of the war, research has been greatly stepped up at Syncro. Our "Visioneers" have some interesting developments ready for you. Whenever you are ready, we will welcome the opportunity of discussing your problems and working with you to place your plant equipment on a sound and profitable basis for the years ahead.

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Machinery for the Wire Industry

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For Five Generations a Part of the American Scene

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TODAY, practically the whole yarn output of Cheney Brothers is going directly to the Government—and to many leading manufacturers of critical war items.

Among these are insulating yarns which have been engineered for specific requirements—produced to take advantage of some particular fiber characteristic.

Naturally, the development of such insulating yarns, with properties undreamed of in prewar days, will be of tremendous advantage to the electrical industry once they can be released.

These will be made available to electrical manufacturers as soon as the Government will permit.

In the meantime, won't you please support the Seventh War Loan Drive to your very limit?

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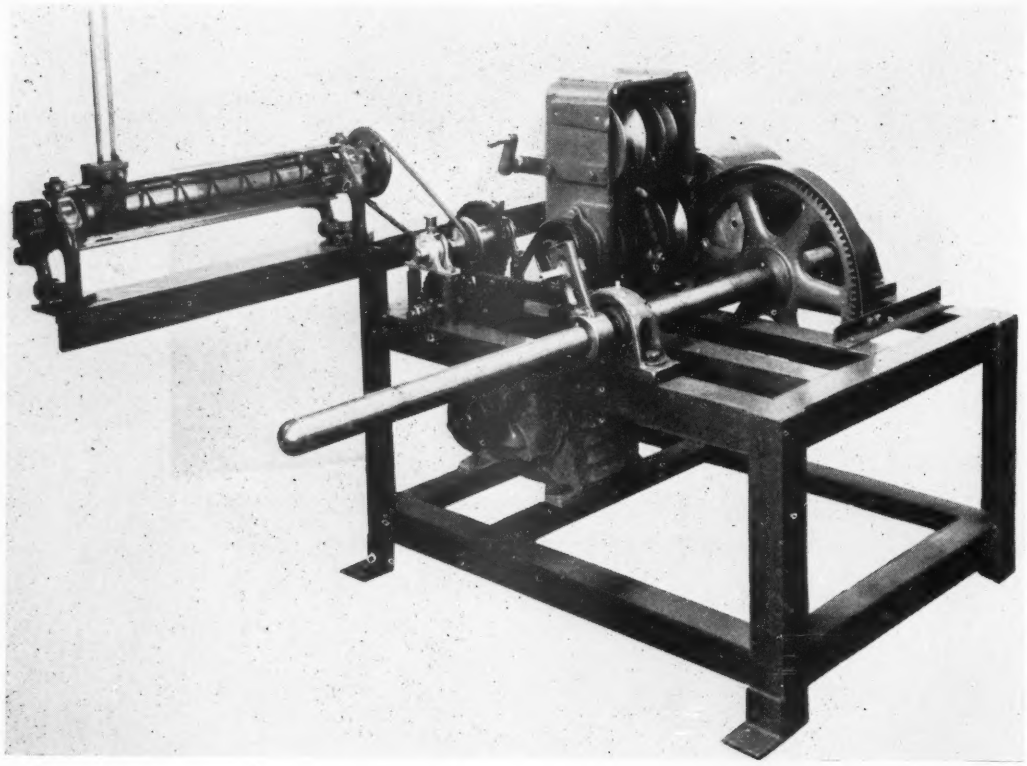
Variable Speed Take-Up —

Suitable For Inspection and Re-Winding Operations.



This machine is primarily designed for automatic spark testing. It also can be used for any sort of winding, particularly for inspection work, and any type of work where a variable speed and instantaneous stopping is required.

The machine consists of a poly-phase motor driving a variable speed transmission which is mounted on ball bearings, capable of running up to 3600 r.p.m., having a ratio of 16 to 1. On the output shaft of the variable speed transmission is a pinion gear which drives the main gear of the take-up which is mounted on two ball bearing pillow blocks. On the output shaft of the speed reducer is also mounted a solenoid brake. In this manner the braking torgue increases proportionately with the speed and there is more braking at higher speeds. The braking in this manner eliminates the shock on the speed reducer and belts.

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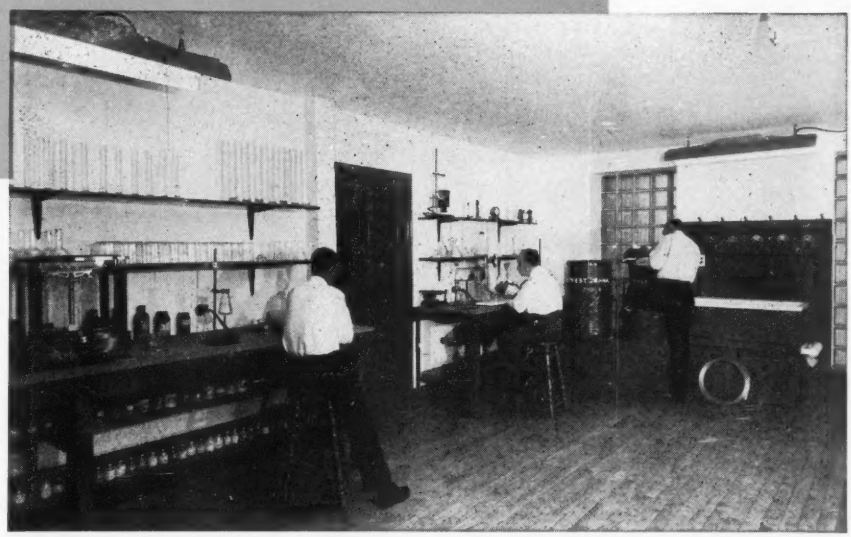
AND
YOU LOOK AHEAD



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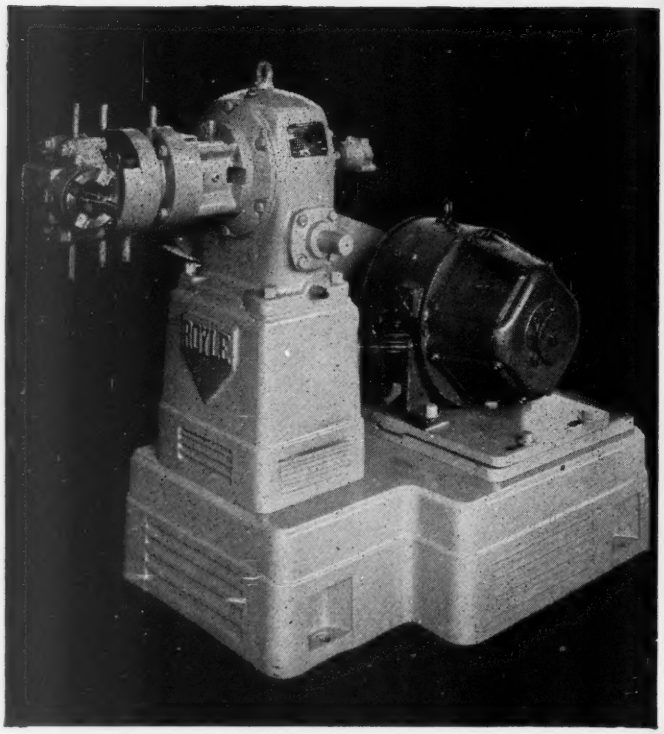

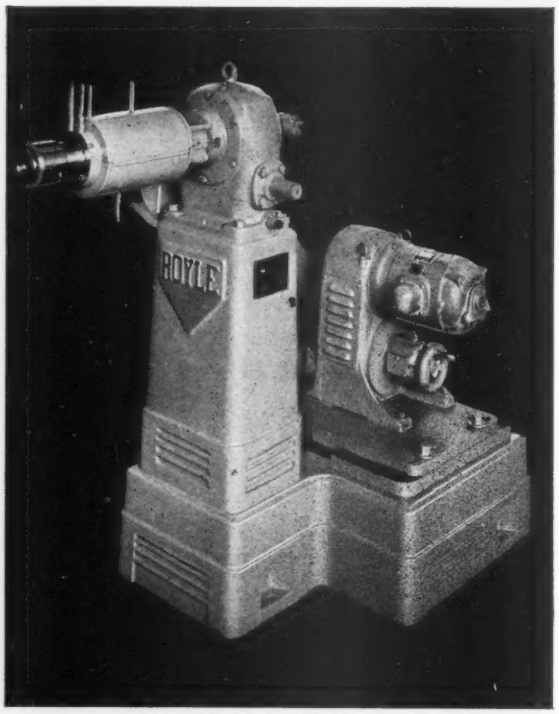

● Rugged is the word to describe these compact and highly efficient Royle Continuous Extruding Machines — the No. 1/2 and No. 1. Their diminutive size embraces all of the characteristics required for larger and heavier extruding processes.

● Primarily designed to become an integral part of laboratory equipment — the technician can be sure that his experiments will have true relation to actual product extruding — these machines are efficient and economical producers of such commercial products as tubes, rods, fine wire insulation, mono-filament and thread coating.

● Except for dimensional differences these machines possess identical characteristics.

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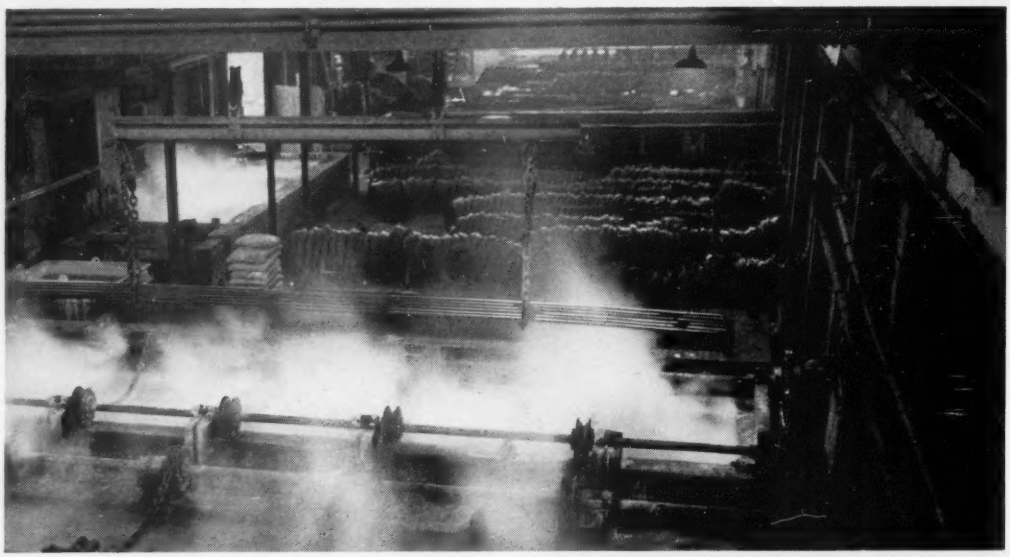

Submerged Combustion Pickling for Cold Drawing at La Salle Steel Co. Hammond, Indiana Plant

BETTER PICKLING . . . AT LOWER COST

with Rodine

A new edition of Bulletin No. 13—"Efficient Pickling with Rodine"—is just off the press. This Bulletin contains 50 pages of valuable information for picklers. Sent free on request.

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The savings in Pickling costs resulting from use of RODINE in the pickle bath are many times the cost of the Rodine used.

RODINE, a selective inhibitor, will show a material saving in acid required to remove scale and at the same time prevent the acid from dissolving clean metal. It also produces a better finished surface. Here are a few of the many advantages of the Rodine inhibited pickle bath:

Less tonnage is dissipated in pickling
A given weight of metal requires less acid to pickle
Acid not wasted destroying clean metal
Cuts loss, due to rejections
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Overpickling eliminated
Metal not embrittled or burned

There are types of RODINE suited to the varying pickling problems. The experience of ACP Technicians and Laboratories is at your service to recommend the Rodine application best suited to your needs.

Protect and Condition with

PEROLINE, a combined chemical and oil, provides better rust protection for work in fabrication, transit or storage. Peroline if applied to a clean metal surface keeps it clean and leaves it properly prepared for painting. No further treatment other than the removal of the oil phase with a vapor degreaser or suitable solvents is required.

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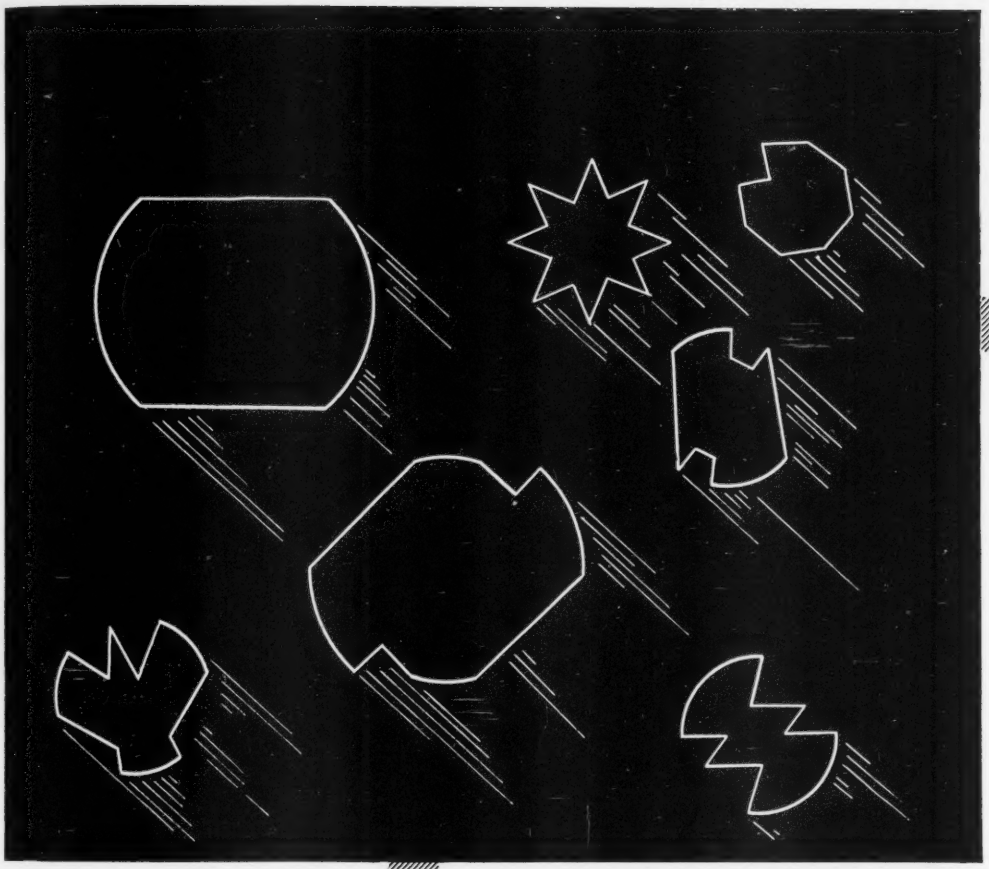

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EYELET DIES

BOLT HEAD DIES

TUBING DIES

SPECIAL
WEAR-RESISTANT DIES

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WIRE DRAWING DIES

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No need to worry about facilities for fast and reliable production of special-shaped dies—that's the specialty of the Hartley Wire Die Company.

Skilled workmen combined with extreme manufacturing care and most critical inspection assure you dies of the high quality you require, and the prompt service you desire.

"From blueprint to finished product" — that's Hartley service. Just send us the prints of the dies you require; no problem is too tough, no job too large or small. Every assistance we can give is yours.

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HARTLEY WIRE DIE CO.

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ON EVERY DIE . . . YOUR
ASSURANCE OF HIGHEST
QUALITY AND SERVICE

The Wire You Wanted

An American Truck lifts an assault boat off a submerged bridge over the Moselle River. Note the reel of wire rope on the front. Official U.S Signal Corps Photo.

MAYBE it's lifting sunken equipment out of flooded streams, rescuing sabotaged vehicles, pulling guns out of mudholes. Maybe it's lashing cargo to ships, tethering barrage ballons, or doing another of the thousands of jobs at which wire rope works overtime for the Army and Navy. For much of the wire you wanted and couldn't get has gone into wire rope for the Armed Services.

Always a large supplier of wire for wire rope, Youngstown mills are now producing at maximum capacity to help meet America's needs for this extremely vital war material--at the same time maintaining those exacting standards of quality that have given Youngstown Yolectro high carbon rope wire its enviable reputation for excellence.

Whether it is wire for today's needs or post-war, we want to talk to you. Our modern plant equipment, our experienced personnel, our knowledge and ability are at your service, to meet your most rigid requirements - now and in the future.

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YOUNGSTOWN

THE YOUNGSTOWN SHEET AND TUBE COMPANY

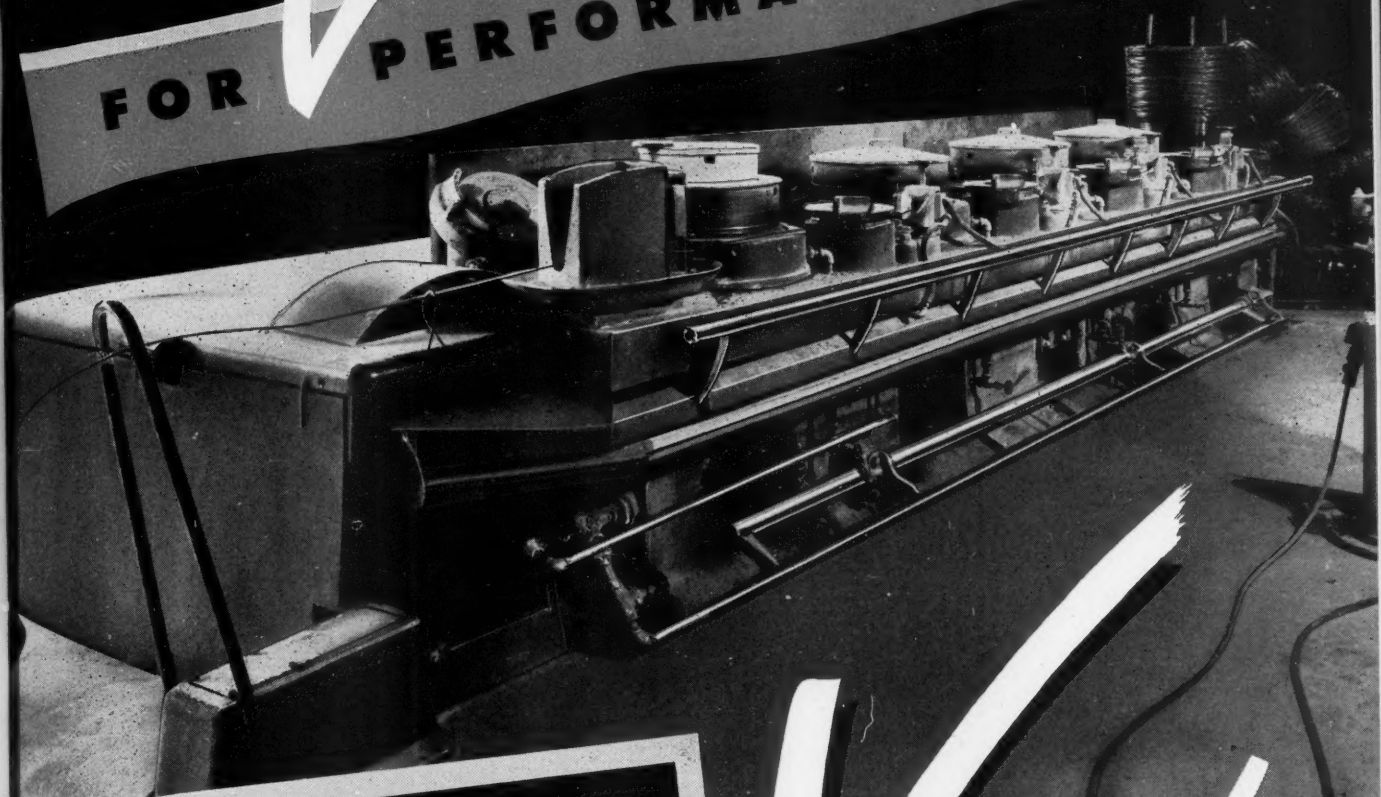
YOUNGSTOWN, OHIO

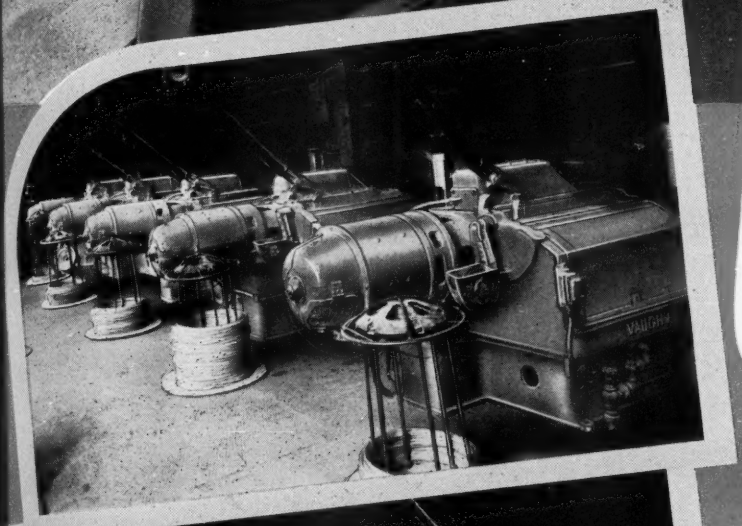
Manufacturers of

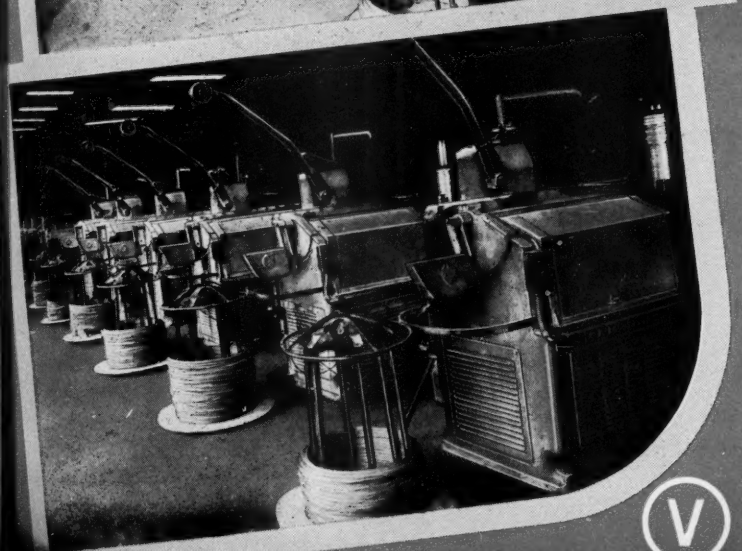
CARBON · ALLOY AND YOLOY STEELS

Wire - Nails - Tie Plates and Spikes - Pipe and Tubular Products - Conduit - Sheets and Plates - Coke Tin Plate - Electrolytic Tin Plate - Bars - Rods

FOR PERFORMANCE . . .







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WIRE DRAWING MACHINERY

You can check-off *performance* as the distinguishing quality of Vaughn Wire Drawing Machinery—performance engineered and built to serve your production requirements *adaptably, flexibly, dependably,* throughout the long life of every fine Vaughn machine!

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COMPLETE COLD DRAWING EQUIPMENT... Continuous or Single Hole . . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys.

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BETTER FINISH

Time spent in shut-downs for die changes, and for polishing and re-cutting dies — all affect production. Tantalum-Tungsten Carbide has a definite lubricating action — it reduces the tendency of the wire or rod to gall and seize as it passes through the die. Result: A smoother finish free from score marks. Use Vascoloy-Ramet *Tantalum-Tungsten* Carbide Dies for better finish and increased production.

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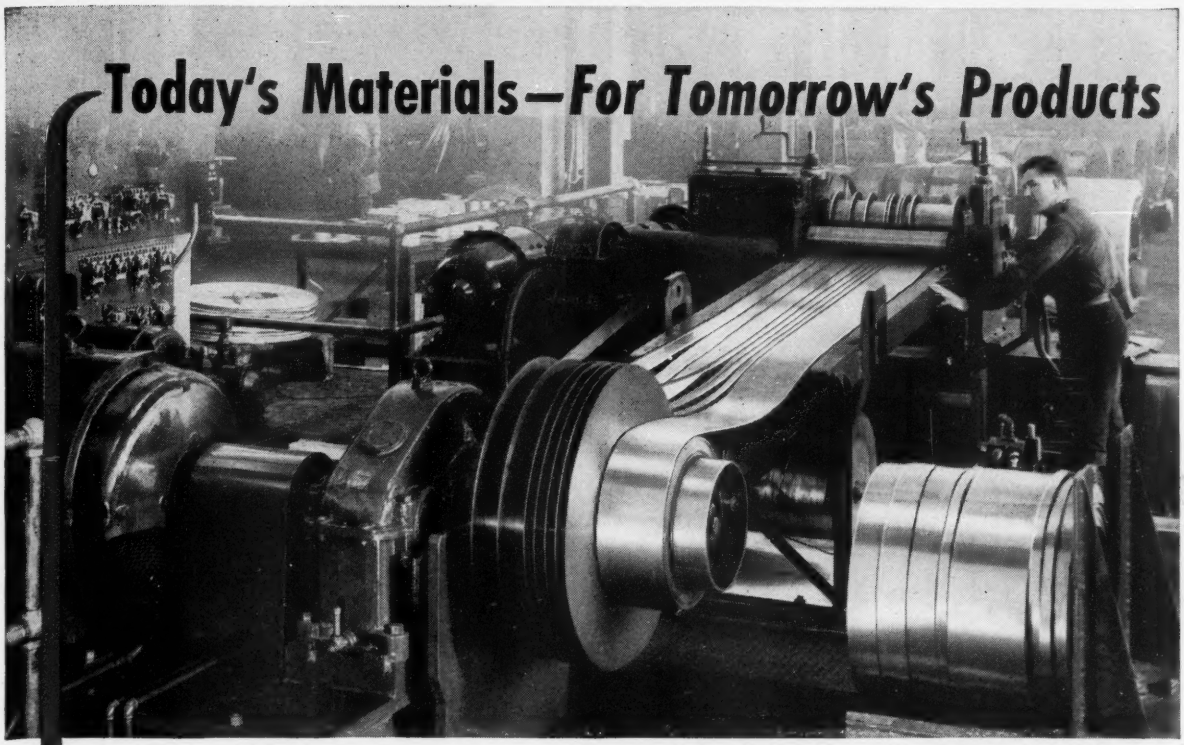

FROM .001 WIRE TO 10" STRIP STEEL ROEBLING QUALITY IS KNOWN

GIVE A BIG HAND to the makers of many wonderful synthetic materials. But remember—materials of *known* qualities—like Roebling's round, flat, shaped wire, and strip steel—have jobs *to do today and tomorrow* . . . jobs they always do best.

Faced with a product problem in which wire is likely to play a part, turn first to Roebling. You're sure of closely controlled steel analysis and grain structure. You've utmost confidence in the tensile strength, ductility and dimensional accuracy of Roebling's round, flat, or shaped wire.

Are you, for instance, fabricating from strip steel—say about 10 inches? Then enjoy production and record-high output when you specify Roebling. Steel analysis, dimensions, finish, exactly fit your requirements. In forming, punching, drawing, Roebling materials add to operating efficiency.

What's available right now? What's likely to be on hand tomorrow? Call in your Roebling engineer! Let him share his knowledge of what's going on: place at your disposal 100 years of Roebling's wire specialization. In today's production, as in tomorrow's planning, you can rely on Roebling.

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TRENTON 2, NEW JERSEY
Branches and Warehouses in Principal Cities

ROUND WIRE

FLAT WIRE

SHAPED WIRE

STRIP STEEL

WIRE ROPE

ELECTRICAL WIRES AND CABLES

WOVEN WIRE FABRICS

ROEBLING

PACEMAKER IN WIRE PRODUCTS

911,772 Messages..

Engineers, purchasing agents, production and sales executives are learning more and more about Fiberglas*-insulated wire and cable from Fiberglas advertisements in the electrical industry's leading technical and trade publications.

Yet, that is only one of the reasons why the demands for these products are increasing so rapidly. Over 12,000 keymen in industry have attended the Fiberglas Electrical Exhibit. Thousands have requested the Fiberglas Electrical Insulation Materials Catalog.

These Fiberglas promotional activities, supporting the advertising and sales activities of the many wire companies, are helping to create a preference for Fiberglas-insulated wire—helping to sell the many advantages which Fiberglas insulation affords users of wire, cable and other electrical products.

Why not capitalize on the expanding market for Fiberglas-insulated wire and cable? Reprints of Fiberglas advertising and the new catalog are available for use by wire and cable companies. Write *Owens-Corning Fiberglas Corp., 1875 Nicholas Bldg., Toledo, O.*

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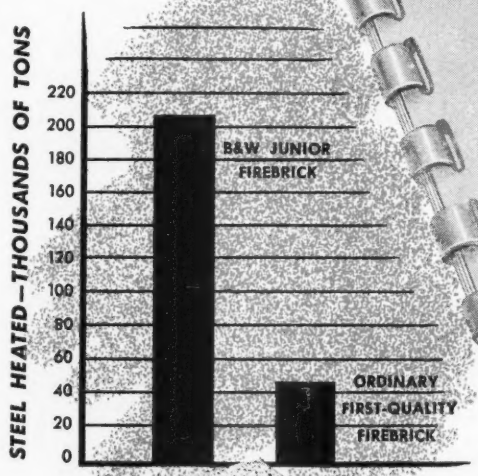
ARMY E NAVY

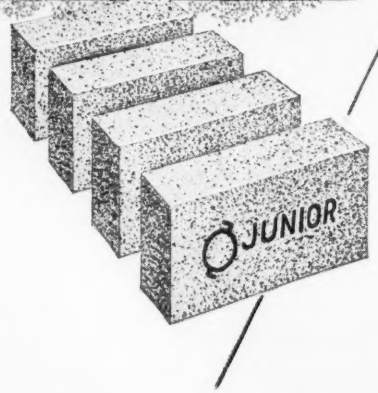
ELECTRICAL INSULATION MATERIALS

4 LIVES IN B&W JUNIOR FIREBRICK

ENGINEERING DEPT.
SERVICE REPORT

BILLET-HEATING FURNACE
Approx. size: 18′ wide, 45′ long.
Fuel: Mainly tar, some coke-oven gas end fired.
Billets: Range from 4″ to 9″ sq.





The remarkable savings being realized through the use of B&W Junior Firebrick are exemplified by a recent service report on the suspended roof of a continuous-reheating furnace. When constructed of first quality fireclay brick, the roof had to be replaced after 45,000 tons of steel were heated. When built of B&W Juniors, this roof stood up during an output of 207,000 tons. The roof was thin, but otherwise in good condition at the end of the run.

In brief, B&W Juniors outlasted fireclay brick about 4.6 to 1.

Thus B&W Junior Firebrick are substantial money savers . . . in the cost of brick per ton of steel heated, in avoiding frequent replacements of fireclay brick, and in eliminating the charges for outages during these replacements.

Your local B&W Refractories Engineer will gladly supply additional information.

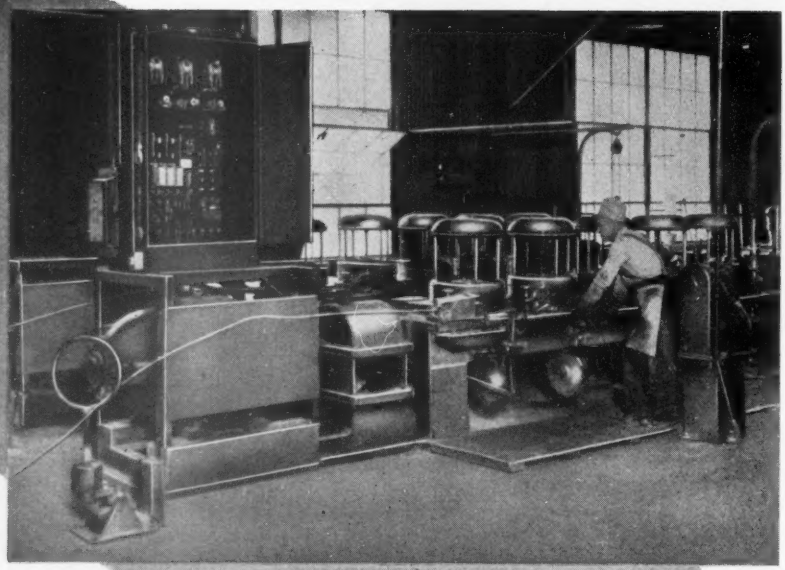
THE BABCOCK & WILCOX CO.
Refractories Division
85 LIBERTY ST., NEW YORK 6, N. Y.

BABCOCK & WILCOX

* BUY WAR BONDS! BUY MORE THAN BEFORE *

R-196

Satisfied with Your Present Drawing Lubricants?



Get in Touch with Headquarters for Wire Drawing Lubricants

Is die life long enough on all your drawing operations to satisfy you?

Are you getting the finish you'd like to on all your wire?

Are scratches and dullness giving you any concern?

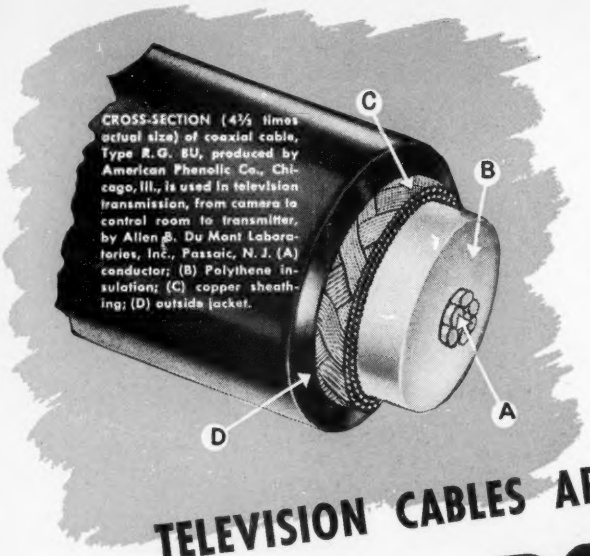
Are you getting the drawing speeds you want, particularly on today's rush schedules?

One of the standard Magnus Drawing Lubricants may give you better results than you are now getting. It will be well worth your while to investigate this possibility, because each item in the present Magnus standard line was originally developed to solve a particular drawing problem or problems. This line now covers all types of metals and all kinds of drawing operations, wet, dry and grease. However, if none of these proved compounds is capable of improving results, Magnus is ready to work in close cooperation with your engineers in developing a tailor-made material suited to your own individual needs.

Won't you give us an idea of the improvements you'd like to see on any particular drawing problems? If one of the standard Magnus materials is not applicable, we will work out a special material for you.

Magnus MAGNUS CHEMICAL CO. 188 SOUTH AVENUE, GARWOOD, N. J.

Wire Drawing Compounds



CROSS-SECTION (4½ times actual size) of coaxial cable, Type R.G. 8U, produced by American Phenolic Co., Chicago, Ill., is used in television transmission, from camera to control room to transmitter, by Allen B. Du Mont Laboratories, Inc., Passaic, N. J. (A) conductor; (B) Polythene insulation; (C) copper sheathing; (D) outside jacket.

FOR LOW POWER LOSS AT HIGH FREQUENCIES

TELEVISION CABLES ARE INSULATED WITH

Du Pont POLYTHENE

SOME OF THE CIRCUITS used in television transmission carry electrical current which changes its direction at the rate of 100 million cycles per second. This extremely high frequency is one of the chief reasons why polythene, a versatile Du Pont plastic, is chosen for insulating coaxial cables used in television transmission.

Polythene is non-polar. Unlike most other insulating materials, its molecules are not influenced by the cycles of oscillation of a current—no matter how rapid.

For this application, polythene's non-polarity is perhaps the most striking advantage. It is far from being the only advantage. Consider, for instance, these others:

1. Polythene's dielectric constant (2.2—2.3) and its power factor (less than 0.0005) *remain almost constant over a wide range of temperatures,* from—50°F to 220°F.

2. Polythene's specific gravity is 0.92.

3. Polythene has outstanding chemical inertness.

4. Its moisture absorption is less than 0.005 per cent.

5 Polythene is flexible over a wide range of temperatures.

This unique combination of properties is responsible for polythene's displacement of other materials in insulating high-frequency wires used by the U.S. Army Signal Corps. This same combination of properties will see polythene advancing into many other fields as soon as it is less urgently needed on the war fronts.

Du Mont Portable Television Equipment in Studio Use.

Du Pont is now producing polythene under WPB allocation. Quantities up to 25 pounds for experimental purposes can be obtained according to WPB Order M-300, Schedule 60. Write for properties chart and other data to E. I. du Pont de Nemours & Co. (Inc.), Plastic Department, Arlington, N. J.

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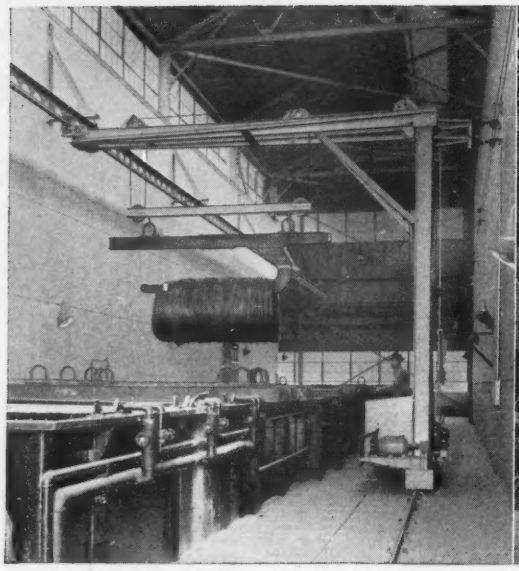
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

For Plastics—consult **DU PONT**

ALWAYS A GOOD BUY — WAR BONDS



The Cleveland Tramrail single-leg gantry crane makes possible the cleaning of rod on a straight-line production basis. One man handles all cleaning operations with this equipment.

The handling of wire in this new nail department is made fast and efficient with Cleveland Tramrail Cranes. The carriers are provided with rigid arms for easy maneuvering.

MODERN HANDLING EQUIPMENT BOOSTS PRODUCTION AT COLUMBIA STEEL CO., PITTSBURG, CALIFORNIA

AFTER a thorough study of the possibilities of straight-line production methods in the cleaning house, for the cleaning of rod and wire, The Columbia Steel Co., decided that with the many obvious advantages of the straight-line method, it would be a logical step in their continuous program of modernization to discard their old cleaning house and build a new one.

The new cleaning house has been completed, and as is evident from the photograph, it is a clean, orderly room, quite unlike old-type cleaning houses. The most important factor in making this new cleaning house possible is the development of the Cleveland Tramrail single-leg gantry cleaning house crane. This enables the handling of rod and wire through the various cleaning operations on a straight-line production basis. As a result, production is boosted, costs sharply cut and health and safety conditions improved.

Likewise, in the Wire Drawing and Nail Departments, Cleveland Tramrail equipment has been installed and is of great help in maintaining production at a high level.

If you work with rod or wire, it will be to your advantage to discuss the many possibilities of Cleveland Tramrail with your local representative.

GET THIS BOOK!
BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

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THE CLEVELAND CRANE & ENGINEERING CO.
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OVERHEAD MATERIALS HANDLING EQUIPMENT

CENTER-SEALED · · · ALWAYS

BY *Lexel Insulation* TAPE

Cut into a roll of Lexel insulated wire, anywhere, and you'll see for yourself how perfectly the conductor is centered within the insulation. The helically-wound, heat-bonded tape effectively bars leakage losses and dielectric failures in a wide variety of low tension installations.

Other Lexel characteristics, contributed by its cellulose acetate butyrate base, include high dielectric strength and insulation resistance and low moisture absorption. It is noncorrosive. All these qualities are provided with about 25% less bulk and weight than ordinary primary insulation.

Ask for test data on Lexel tape for instrument, control, lead-in and hook-up wires, electronic and communication circuits and similar uses. Quick deliveries on priority orders.

CUSTOM-MADE INSULATION

As a regular service, Dobeckmun engineers also develop laminated insulation products, custom-made to special purpose specifications, such as slot cell and phase insulation for motors, insulation for shipboard cables and other uses. If your requirements are unusual, call on us.

"LEXEL" is a registered trade-mark of The Dobeckmun Company.

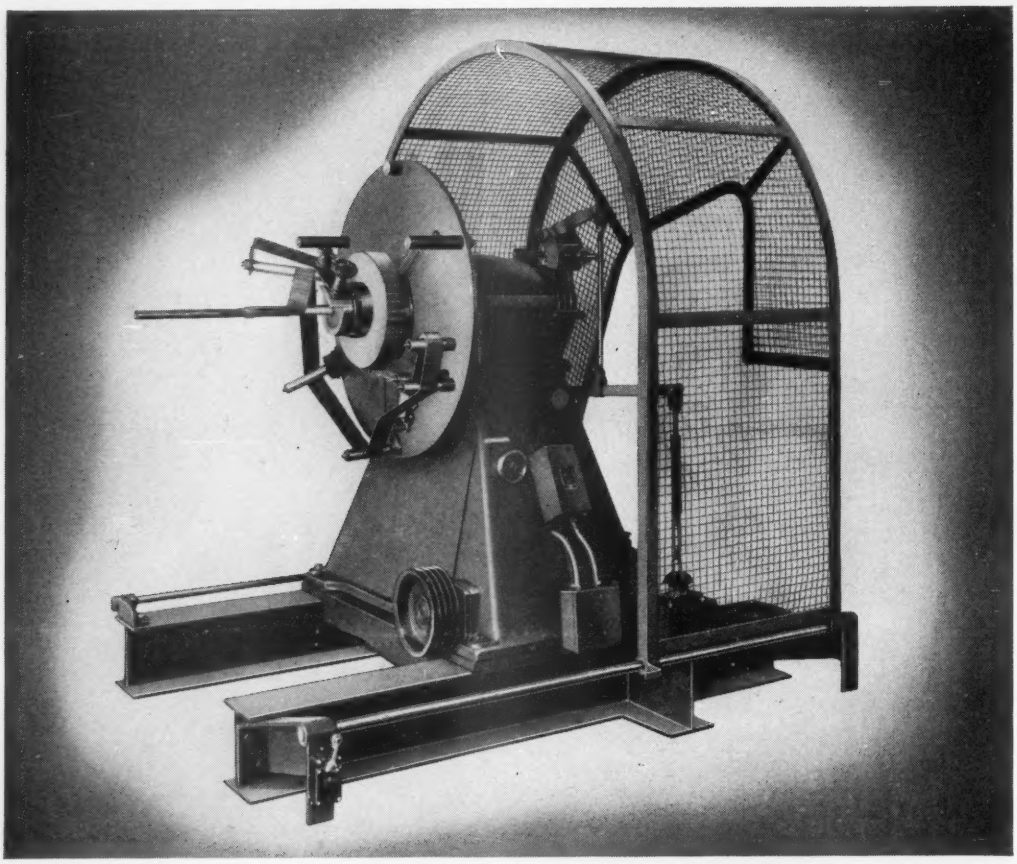
Made by the makers of DOBAR insulation paper and DOPLEX laminated tape.

THE DOBECKMUN COMPANY

CLEVELAND PLANT

INDUSTRIAL PRODUCTS DIVISION · CLEVELAND 1, OHIO

CONCENTRIC TAPING MACHINE



The unit illustrated is a concentric type taping head, designed to apply paper, cambric, friction, natural or synthetic rubber tapes on electric cables.

The unit will handle packages up to 24-inch diameter by 4-inch width.

Heads are provided with electrically operated stop motions, interlocking guards, electrically operated brakes, automatic tension control, and variable speed drive.

These machines can be furnished in single units to be used in conjunction with stranding and other machines, or as multiple head units complete with motor drive, capstan and take up.

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NEW ENGLAND BUTT COMPANY

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PARALLEL MULTIPLES

SILK COVERED
COTTON COVERED
CELANESE COVERED
GLASS FIBRE COVERED
LITZENDRAHT AND
SPECIALS TO ORDER

● There's more to present day engineering and design problems than shortages of materials, priorities, etc. There is also the question of whether specifications have been rigidly adhered to. Wire, for example, must meet such requirements as specific electrical properties, flexibility, tensile strength, laying speed, uniformity, etc.

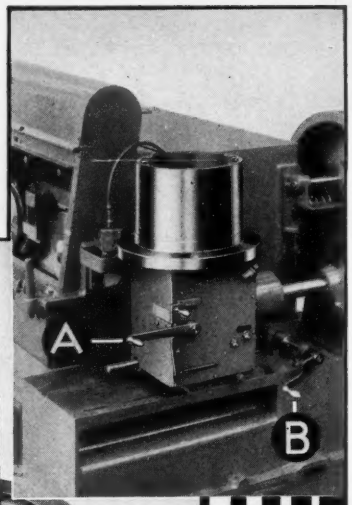
Whether it's a buyer's or seller's market, WINCO magnet wire products are drawn to exact specifications. Uniformity of product is guaranteed by mercury process tests and careful supervision guards against variations in consistency, structure or electrical values.

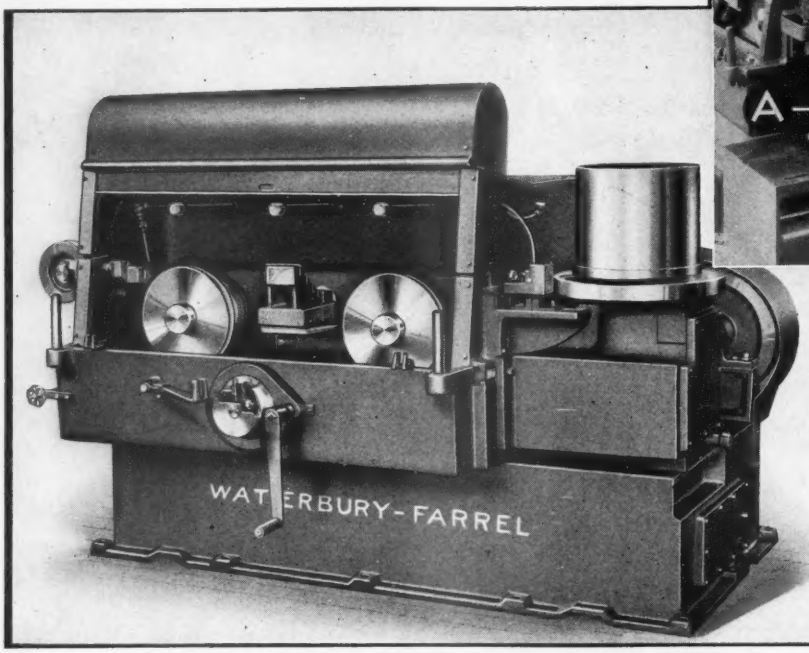
If you have a wire problem, our complete facilities are at your disposal. Send blueprints or specifications for recommendations, without obligation. Samples sent on request; write today.

WINSTED DIVISION

WINSTED HUDSON WIRE COMPANY CONNECTICUT

WIRE DRAWING MACHINES





FOUNDED WATERBURY FARREL 1851

by WATERBURY-FARREL

WITH WIRE BLOCKS WHICH *rotate in either direction*

Upright Cone Continuous Machines with provision for quickly changing the rotation and position of block.

Two conveniently located removable handles do the trick in jig time—

A — changes direction of rotation

B — shifts position of block - - -

The machines are available with blocks of various diameters or with spooling devices. Our wire drawing machinery is described in Catalog W.

• WIRE AND ROD MACHINERY • COLD HEADING MACHINERY, ETC. •

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CHICAGO CLEVELAND NEWARK, N. J.

WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 20 JUNE, 1945 No. 6

Designated as

Official Publication By The Wire Association

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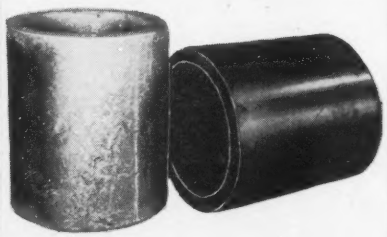
"STEVENS"
FLANGED STEEL
TRAVERSES



FOR WIRE AND CABLE

Sizes: as light as 18 gauge steel and as large as 56" in diameter and 56" in traverse Furnished in plain, painted or hot-dipped galvanized finishes. Width of flange and size and number of bolt and drain holes made to fit customer's requirements.

Assembly costs reduced by eliminating labor of handling a large number of small parts. Number of trips per reel increased 50% to 100% before cut downs or complete scrapping is necessary.

Manufactured under license arrangements with Western Electric Co., Inc.

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Firthaloy Service

carries a complete work kit *

Firthaloy Service comes to your mill equipped to handle your particular problem in all its phases. In its Work Kit are the standard tools of experience, basic knowledge, modern facilities, engineering skill, and resourcefulness. Added to these are the special accessories of flexibility—the ability to adapt itself to your particular requirements.

Firthaloy Service has more than kept pace with modern developments . . . in most cases, it has set the pace. There is nothing missing . . . it is a service complete in all respects . . . and safe, because behind Firthaloy Service is the "know-how" supported by many production achievements in mills where it has worked side by side with operating men.

Call in Firthaloy Service to help modernize your mill and learn first-hand how thoroughly it handles your problem.

* *Ask the trade*

For instance—two Firthaloy Service men were sent to a copper wire-mill die room where they worked for a week . . . ripped, polished and sized dies . . . helped correct various mistakes that had crept into the customer's die-room practices. Results—increased die life—higher production—better quality wire.

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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
Wire Products and Insulated Wire and Cable.
DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 20 JUNE, 1945 No. 6

Salt Baths in the Wire Industry

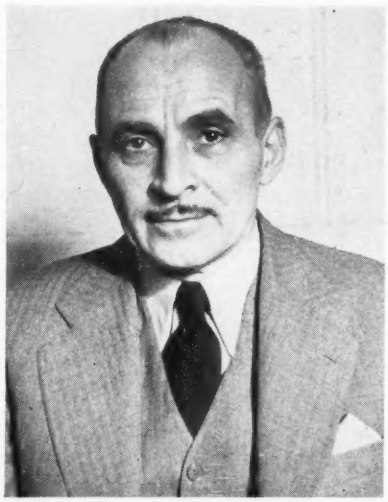
By A. R. Stargardter,

Chief Metallurgist, Ajax Electric Co., Inc., Philadelphia, Pa.

THE annealing process has long been recognized as one of the most important operations in the manufacture of wire and wire products. Its technology is dual-purposed; while primarily a procedure for the removal of stresses, the annealing treatment is equally essential as a means for increasing ductility by softening the wire thus processed. Physical properties produced by the heat treatment applied are not the only measurable factors for determining a Wire Annealing Department's efficient functioning; for, not infrequently, methods and equipment employed have a resultant influence on costs, both immediate to the annealing treatment as well as relative to subsequent operations, which are considered on a parallel plane with the physicals by management and supervisory personnel in the industry today. It is, therefore, of significance to take an inventory from time to time on current developments and practices which may be focused on specific topics as individual contributions to advancement and progress.

✦ ✦ ✦

ONE such development, not new by any means, but nevertheless viewed with general skepticism 8 to 10 years ago upon introduction to wire makers, is the application of salt bath furnaces for wire annealing. Liquid baths, while admittedly not a "cure-all", have enhanced credulity today by the generous growth in the number of installations in many of the country's leading wire plants; and, employed within the broad limits discussed in this article, wire annealing by immersion in molten salts extends certain operational advantages worthy of close scrutiny.



A. R. STARGARDTER

Mr. Stargardter's former affiliation was with Eastern Stainless Steel Corporation, Baltimore, as Chief Metallurgist. In this capacity, he provided consultation to many of the country's largest stainless steel fabricating firms. A member of ASM since 1920, he has served as an officer of the Baltimore chapter and was a member of the War Production Advisory Committee. Prior to this as Chief Metallurgist for Gillette Safety Razor Company, Mr. Stargardter was responsible for the mechanization of the metallurgical operations incident to razor blade production. He has an extensive back ground with steel producers in melting, hot-working and heat treatment of carbon and alloy steels.

✦ ✦ ✦

Development of Salt Bath Furnaces

THE inherent advantages of heating in a medium composed of molten salt have long been recognized. But, salt baths, designed to be heated externally possessed certain shortcomings such as short operating life of metallic pots, thermal lag in heat input under heavy production conditions, etc. Such features limited the practical use of the salt bath. As long ago as 1908 European and American inventors began developing the immersed electrode type salt bath as a way to eliminate the objectionable features. All salts suitable for use in a molten heat treating bath are practically non-conductors of electricity when in the solid state but become fairly good conductors when molten. Salt baths with immersed electrodes cause electric current to flow directly within the salt itself.

✦ ✦ ✦

THE development of the immersed-electrode principle not only solved the deficiencies posed by externally

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heated baths but made available the following advantages of salt bath treatment:

1. Absolute uniformity of heating.
2. Total elimination of all atmosphere with its accompanying problems of scale, pitting, decarburization, etc.
3. Heating cycles of 1/4 to 1/6 the time required by hearth type heating.
4. Ease of starting the bath and simplicity of operation.

✦ ✦ ✦

FOR initial starting of an immersed electrode salt bath furnace, it is only necessary to place enough salt in the pot to be about 6 in. above the bottom of the electrodes, add some granular graphite between the electrodes over the surface of the salt crystals, turn on the power and apply pressure on the graphite. As the salt melts, more dry salt is added from time to time until proper depth and operating temperature are reached. In the event of a lengthy power interruption (10 hours or more) or other emergency which would cause the bath to freeze solid in the pot, it is only necessary to add a small quantity of fresh salt around the electrodes directly on the top of the solidified bath — place some graphite between the electrodes, turn on the power and the salt gradually melts down until the entire bath is once again ready for operation.

✦ ✦ ✦

FIGs. 1 and 2 illustrate the principle of operation. A group of electrodes (usually in pairs) are immersed in the salt, which, being melted, is an electrical conductor. These electrodes are closely spaced, leaving only a small gap between them. A low voltage (anywhere from 5 to 25 volts), obtained by means of a step-down transformer, is impressed across the electrodes. Alternating current then flows through the molten salt lying in the gap between the electrodes, which heats the salt by virtue of its own resistance to this flow of current. The pairs of electrodes are arranged in close proximity along one side of the bath, so that the working space is kept distinct from the heating zone. Restricting the heating zone to the side of the bath in this manner would seem to defeat the possibility of obtaining uniform heating, but the precise opposite is true. This is due to the studied grouping and design of the electrodes, which create electromagnetic forces in such a way as to provide an automatic stirring action throughout the entire bath, as shown in Fig. 3.

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Equipment Requisites

PRIME among the requisites for equipment selected to anneal wire are the following:

1. Scale, decarburization or other compositional changes must be effectively controlled; preferably eliminated.
2. Temperature must be maintained accurately within the prescribed annealing range under operating conditions.
3. There must be assurance that work is held at indicated temperatures.
4. Floor space for the annealing should be held to a minimum.

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WHILE these essential specifications can be met by fuel-fired furnaces, they not always are fulfilled; for example: scale-free work may be produced in atmosphere furnaces—but decarb occurs frequently, as in the cases of wire made of SAE 52100 and other hypereutectoid steels. Electrode salt baths provide an easily controllable heating medium with total avoidance of overshooting. The resultant effects of loose temperature control during the anneal are well known: in the hardenable grades of steel wire, if the anneal is carried out at either too high a temperature or if the cooling rate is too rapid, localized hardening results; and, in all wire steel grades, if the anneal temperature is too low, a fully stress-relieved product cannot be produced and the degree of retained hardness will have a consequent damaging effect on dies.

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AS a result, salt baths are now well established in commercial use for the process annealing of wire composed of engineering grades of steel, including bearing steels, as well as the stainless steels. Salt baths in which the low alloy steels are being process annealed, e.g. such grades as straight carbon, carbon-moly, high carbon and chromium ball bearing steel, etc., are maintained in the range 1275 degs. F. to 1325 degs. F., while those baths set up for the purpose of process annealing stainless steel wire are maintained at from 1450 to 1550 degs. F. for the straight chrome grades, and from 1850 to 2100 degs. F. for the austenitic chrome nickel grades.

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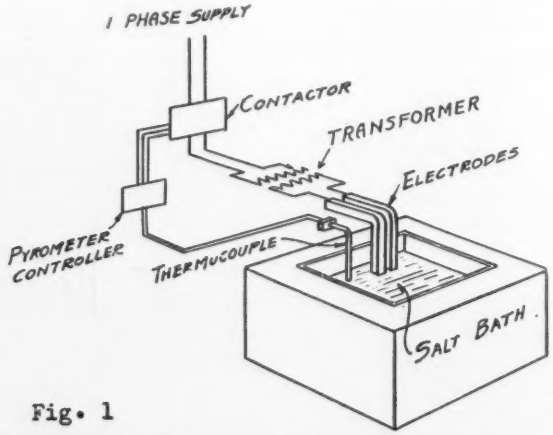

Fig. 1

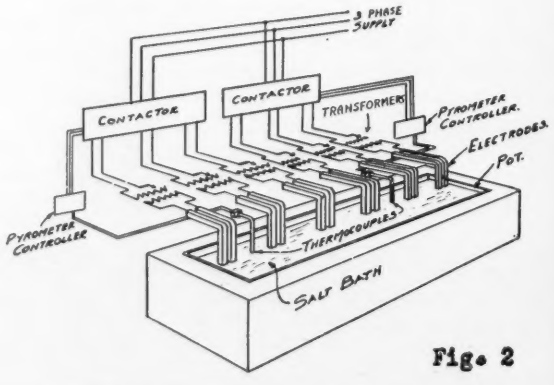

Fig. 2

Fig. 1 and 2—Any number of groups of electrodes, containing two, three or more electrodes per group, may be used. The diagrammatic sketches show two typical arrangements—Fig. 1, the simplest form employing a single pair of electrodes; and, Fig. 2, a large Ajax-Hultgren Furnace using six pairs of electrodes, divided into two separately controlled zones of three pairs each. ✦ ✦ ✦ ✦ ✦

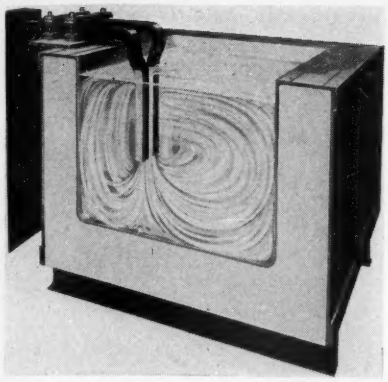

Fig. 3—Effect of electromagnetic forces . . . a vigorous circulation throughout the bath. ✦

IN all cases, these baths are yielding a satisfactory degree of stress relief, and are furnishing at all times an annealed product substantially free from surface scale as well as complete freedom from decarburization. Suitable salts are now commercially available for the optimum handling of each grade of steel.

✦ ✦ ✦

Three Typical Installations

IAN interesting example of salt bath wire annealing is shown in Figs. 4 and 5. This installation was designed for handling process anneals of straight 18-8 and stabilized 18-8 and other nickel alloys at 1850 degs. F. as well as for final anneal of all stainless grades at 1925 to 1950 degs. F. Coils of wire, up to 20 in. O.D., are loaded on a suspending yoke (or saddle) which supports the inner periphery of the coils, thus preventing "horse-collaring", and are immersed into the bath of neutral salt. The average load treated is about 170 lbs., requiring only 30 minutes immersion time. This annealing production, carried out in a single furnace, with salt bath working dimensions of 42 in. L. x 22 in. W. x 30 in. Deep, equals in 8 hours operation the output of six previously used atmosphere-type strand annealers in 24 hours operation. Actually, shipments by this producer were stepped up 25% and only a small fraction of the floor space is required as compared to the six continuous annealers for comparative capacity. Even though cost of salt alone is relatively high because of very small sizes processed, the cost per pound of annealed wire is substantially below previous costs.

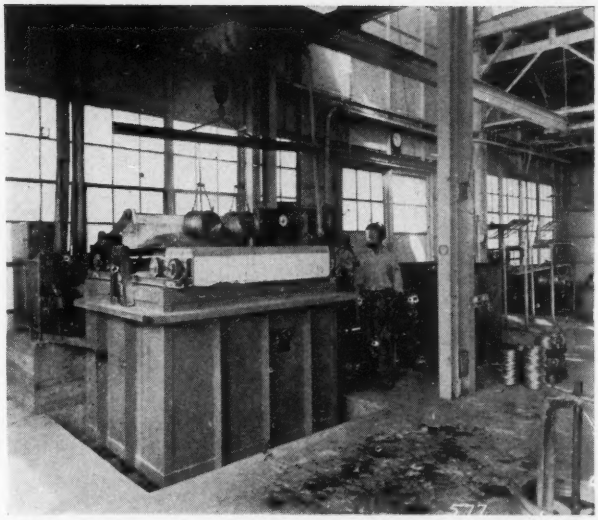

Fig. 4—This one Ajax-Hultgren Electric Salt Bath Furnace anneals as much stainless wire as six previously used continuous strand annealers with cracked ammonia atmosphere. ✦ ✦ ✦ ✦

WORK processed in the equipment ranges in size from 10 gauge rod to finer than 30 gauge wire. In all instances, coils are bound tightly together, and in this manner a water quench may be used with entire satisfaction. A slight oxide film is readily removed by a light pickling in two acid solutions, usually 10% sulfuric followed by a bath consisting of about 10% nitric acid and with about 1% hydrofluoric at 130 to 140 degs. F.

✦ ✦ ✦

IT is now established practice in many wire plants that pickling is necessary even on bright annealed wire on all sizes down to 0.018 in.

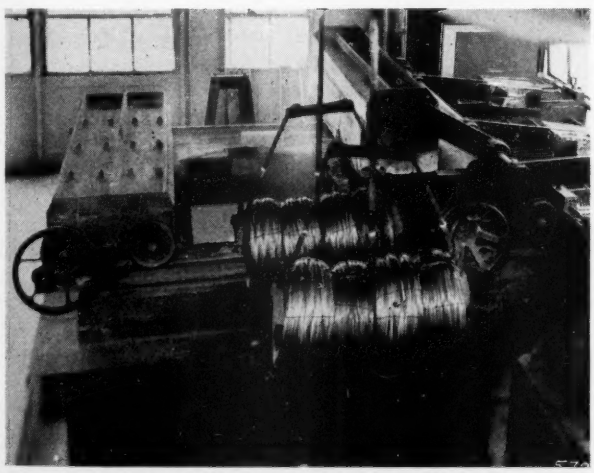

Fig. 5—Close-up of load showing method of fixturing for suspension in the salt bath. The furnace is constructed with a split cover designed for combination rolling and tilting movement. The same type of design can be applied to a furnace for annealing coils of heavier wire or rods up to 36 in. O.D. or bars in any length. During stand-by periods this cover extends appreciable savings in power. ✦ ✦ ✦ ✦

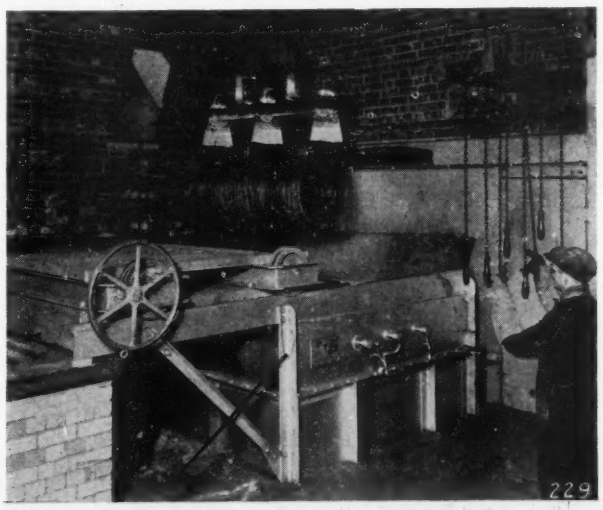

Fig. 6—A variation in fixture design for handling a large charge of coiled wire in a salt bath process annealing operation. Most installations can be adequately served with one operator. ✦ ✦ ✦

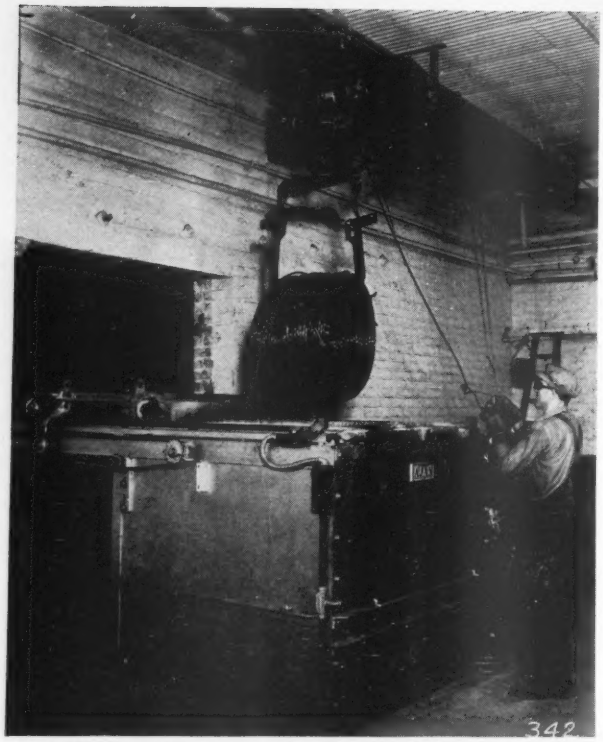

Fig. 7—A 700 lb. charge of coiled steel wire is brought to annealing temperature (1300 degs. F.) in less than 15 minutes. This single salt bath furnace turns out an average of 1500 lbs. of uniformly annealed wire per hour.

This procedure has been made necessary by the faster speed of modern drawing installations which make possible great reductions;

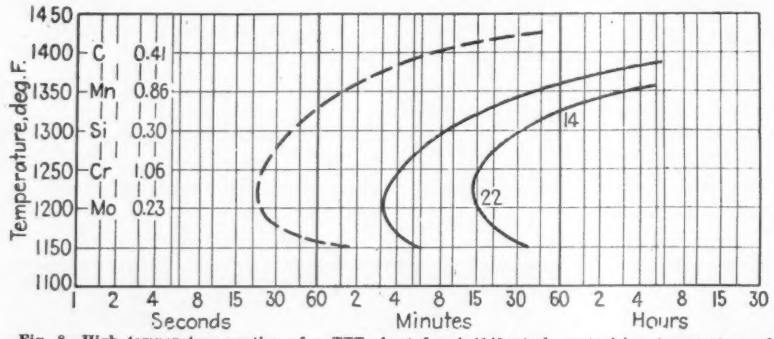

Fig. 8—High temperature portion of a TTT chart for A-4142 steel, austenising temperature of 1500 degs. F. To attain a finished hardness of 14 Rockwell C, a temperature of 1325 degs. F. maintained for 1 hour is indicated.

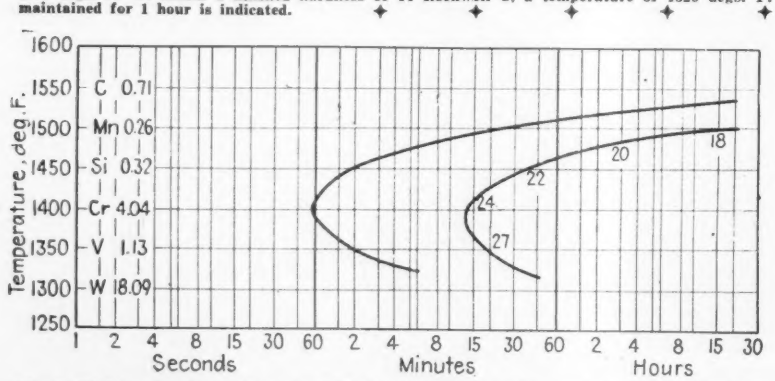

Fig. 9—High temperature portion of a TTT chart for Rex AA high speed steel, austenizing temperature 1650 degs. F. Hardness of about 21 Rockwell C may be obtained by holding at a subcritical temperature of 1450 degs. F. for 1 hour; while if it were essential to obtain a hardness as low as 18 Rc, it would be necessary to hold at 1500 degs. F. for 15 hours.

however, it is necessary to either lead coat or copper coat the wire when drawing down and this coating necessitates a flash pickling in order to provide a suitable adhering surface for the coating. Stainless steel manufacturers have found that a bright annealed finish does not hold the drawing lubricant sufficiently well enough to avoid harmful effects on dies and that in some cases die costs per ton exceeded the actual annealing figures.

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II AT another plant, a salt bath 72 in. L. x 56 in. W. x 48 in. Deep is employed for process-annealing 0.60-0.65 Carbon wire. Selection of molten baths, here, was primarily for the ability to prevent decarburization. Wire, in thickness from 1/32 in. to 3/32 in., is coiled in sizes of 16 in. I.D. x 24 in. O.D. for lighter gauges, and 28 in. I.D. x 32 in. O.D. for heavier gauges. Four coils, each weighing from 200 to 250 pounds, are rigged on one fixture and immersed for 40 minutes in the bath maintained at 1300 to 1320 degs. F. Following the salt bath treatment, coils are suspended in a blank iron tank for cooling in still air with a subsequent water rinse operation prior to pickling for 5 minutes in a cold 5% hydrochloric acid solution. Then, a final rinse and wire is ready for further processing. Output through this processing averages 1325 lbs. per hour and all equipment is compactly confined within 80 ft. x 30 ft. floor area. Hardness before annealing runs 95 to 100 Rockwell B with uniform softening to 85 Rockwell B after the anneal. Satisfaction is evidenced by the fact that the equipment has been in continuous operation from the time it was installed seven years ago on a 12 hours per day, 6 days per week schedule. Even with an unusually high power cost of $0.025 per KWH, which causes this plant to operate only on night shift schedules, the total cost of annealing is worthy of examination:

Annealing Cost Breakdown	
Electric Power	$5.00 per Ton
Labor	1.50
Maintenance	0.20
Salt	1.25
Total	$7.95 per Ton

✦ ✦ ✦

III PROCESS annealing of SAE 52100 steel wire in sizes from 0.050 in. to 0.687 in. is typical

of yet another salt bath installation with a large producer. This bath is 67 in. L. x 55 in. W. x 67 in. Deep. The average charge, consisting of 8 coils about 30 in. O.D., weighs 1000 lbs. and is fixtured for handling with a saddle support identical to the two examples just cited. Operation of the liquid bath furnace is currently maintained without any idle or non-productive time on a 24 hr. schedule seven days per week. In each 24 hr. cycle, a total of 30 loads are annealed —giving a yield of 15 tons per day. Each charge is immersed in the molten bath, operated at 1280 degs. F., for 40 min., whence it is removed and air cooled until the temperature is below 500 or 600 degs. F. Work is then dipped in water prior to a 2 min. immersion in a cold 15% sulfuric acid solution, followed by a final water rinse. The hardness of the wire after drawing and as delivered to the annealing department is 100-105 Rockwell B, the salt bath treatment reduces hardness to the desired 70-75 Rb.

✦ ✦ ✦

WHILE the SAE 52100 steel with 1% carbon and 1.5% chromium readily decarburizes in most atmospheres, no appreciable decarburization has been experienced through use of the salt bath annealing process. Cost-conscious wire producers will readily perceive the economies of original equipment investment for equal annealing capacities in the electrode salt bath furnace as compared to conventional atmosphere units; however, the overall operational cost is not so apparent, and therefore the following data (applicable to the plant procedure outlined for SAE 52100 process annealing) should be of interest: A connected load of 250 KW consumes electrical power at this plant at a rate of $0.006 per KWH, while labor assigned to the job consists of only one man. Salt losses for dragout are 15 lbs. per ton of wire processed, and furnace maintenance is low since pots and electrodes deliver fully two years of service under the operating conditions at this plant before replacements are required.

Annealing Cost Breakdown

Electric Power	$1.17 per Ton
Labor	1.60
Maintenance	.17
Salt	.45
Total	$3.39 per Ton

Cyclic Annealing

ALTHOUGH existing installations of salt baths are used for the purpose of process annealing wire to afford stress relieving treatment after cold drawing, metallurgical reasoning would seem to indicate that salt baths should prove useful for cyclic annealing of the wire rod before the drawing operations. Hundreds of salt bath installations have been set up for other forms of Isothermal Heat Treatment designed to accomplish hardening and tempering. In this method, the work is held in one bath for a suitable length of time at the austenizing temperature (above the transformation range), then quickly transferred to a second bath (Isothermal Quench) maintained at the desired quenching temperature — usually between 400 and 700 degs. F. in order to produce the desired hardness and microstructure. Frequently, the steel is removed from the Isothermal Quench bath and is processed through a third salt bath for final tempering.

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THE necessary information relative to this treatment is secured from data offered by the well-known TTT curves; namely, those curves which yield information as to proper Transformation - Temperature - Time values, enabling the operator to choose the optimum temperatures for aus-

(Please turn to page 448)

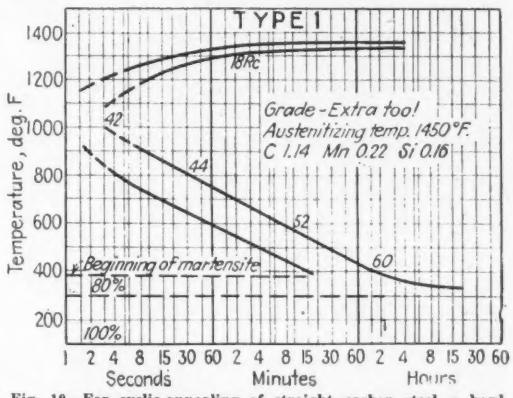

Fig. 10—For cyclic-annealing of straight carbon steel, a hardness of about 18 Rc can be obtained by holding in the sub-critical transformation bath for about 8 to 10 minutes. ✦ ✦

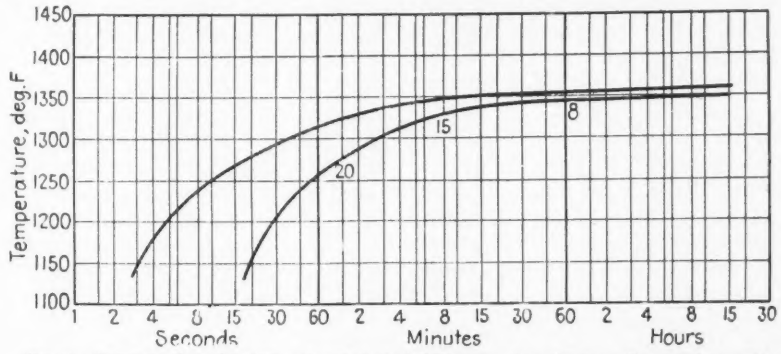

Fig. 11—Upper portion of a 1.16 carbon tool steel TTT curve. In order to cyclic-anneal from the data indicated, work should be held for the proper length of time in the austenizing bath at 1410 degs. F., followed by immersion in the sub-critical transfer bath for about 15 minutes in order to secure a hardness of Rockwell 13C. ✦ ✦ ✦ ✦

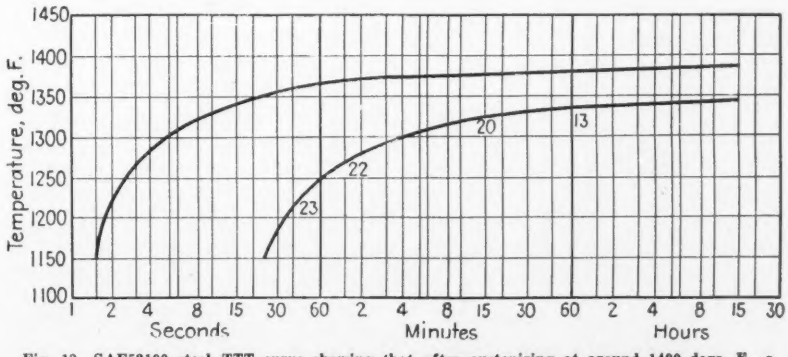

Fig. 12—SAE52100 steel TTT curve showing that after austenizing at around 1400 degs. F., a hardness of Rockwell 13C may be produced by holding for 1 hour in the sub critical bath at a temperature of about 1340 degs. F. ✦ ✦ ✦ ✦

Galvanizing

By Commander W. H. Spowers, Jr., U.S.N.R.

Some Principles of Zinc Coating

ONE of the most persistent problems which confronts the worker in iron and steel is the prevention of corrosion. We cannot rid ourselves of the agents which effect the corrosion of iron without, at the same time, ridding ourselves of the agents which are essential to life itself.

✦ ✦ ✦

AIR is indispensable both to human respiration and for the formation of rust and other oxides, for which it supplies the oxygen; moisture is necessary for the formation of clouds, which makes the earth fertile, and it also supplies the medium in which rusting takes place and hydrates the oxide; carbon dioxide is an animal by-product and a raw material for the vegetable world, and the exchange of carbon dioxide and oxygen, which is continually taking place between the animal and the vegetable kingdoms, is of vital importance. Then, on the other hand, rust is not readily formed, if at all, unless there is an acid present, and the acid which is most universally distributed is carbonic acid, or hydrated carbon dioxide.

✦ ✦ ✦

THERE is, therefore, a close relationship between the processes of living and rusting, but while human beings make up for the rusting or decaying of their tissues by nutrition, it has not yet been discovered how to feed or regenerate iron, and until such a discovery is made we are compelled to take our cue from the ancient Egyptians and resort to embalming.

William H. Spowers, Jr., well-known consulting engineer, specializing in Galvanizing is also the author of "Hot Dip Galvanizing Practice," and has lectured and written many articles on the various phases of galvanizing previous to being ordered to active duty. ✦ ✦

THERE are two general ways of embalming iron so as to prevent its decomposition, which might be called, respectively the metallic and non-metallic methods. In the non-metallic method the articles are coated with an organic substance, usually oil or varnish, the efficiency of which depends on its being more or less air-tight. When coloring matter is added to the oil it becomes a paint, but I understand from authorities on the subject, that a varnish free from pigments is preferable to anything else.

✦ ✦ ✦

THE metallic method consists of coating the iron with some other metal, and it is this method in which we are interested. Iron rusts less easily than does steel. This is perhaps due to steel being a very composite material. In the iron which forms a bulk of its composition, are dissolved or immersed a great variety of other substances. Some of these are simple such as carbides, sulphides, phosphides and silicides. The carbon compounds are very numerous and diversified being due to the different heat treatments. The best known are cementite, pearlite, and martensite. Just as variety is to some people the spice of living, so is heterogeneous composition the spice of rusting, in the present instance at any rate.

✦ ✦ ✦

IT is difficult for many persons to understand why zinc is the best rust preventive for iron and steel, and they believe it is on account of its cheapness that it is so extensively used. They have an idea that lead would answer far better, and as it is more non-corrosive than zinc would protect the iron better. But the softness and difficulty of application react against the use of lead.

✦ ✦ ✦

THE very fact that zinc is a corrosive metal does not effect its properties when applied as a coating to iron or steel. Indeed, if it did not corrode, it would not be of value for such a purpose. When iron or steel, which has been coated with zinc, is exposed to the atmosphere, a galvanic action is set up, although of course, extremely slight. Any two dissimilar metals form a galvanic couple, but as zinc is the most electropositive metal, the galvanic action between the zinc and iron is as great as could be obtained when iron is used for one of the metals composing the couple.

✦ ✦ ✦

THE result is, therefore, that with the slight galvanic action set up on galvanized iron or steel, when ex-

Quotations from "Hot Dip Galvanizing Practice" by W. H. Spowers, Jr.—Penton Publishing Company, Cleveland, Ohio.

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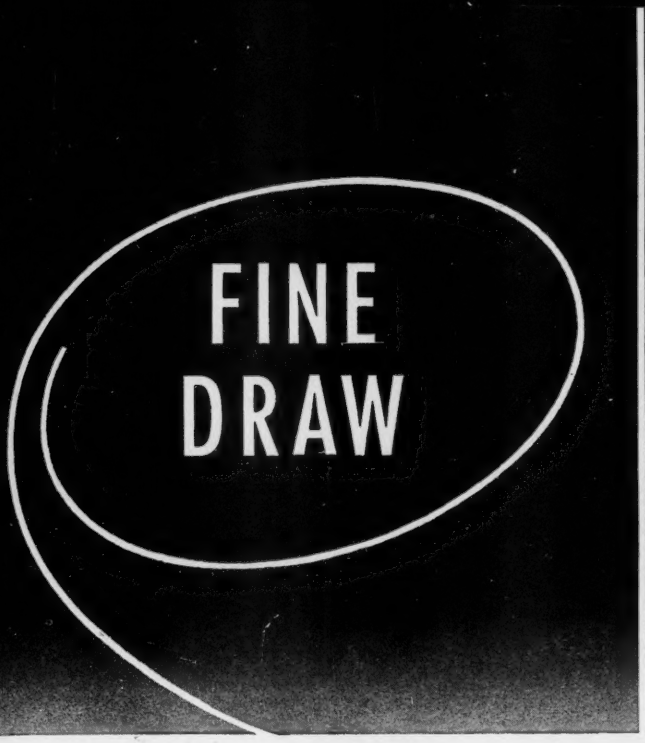

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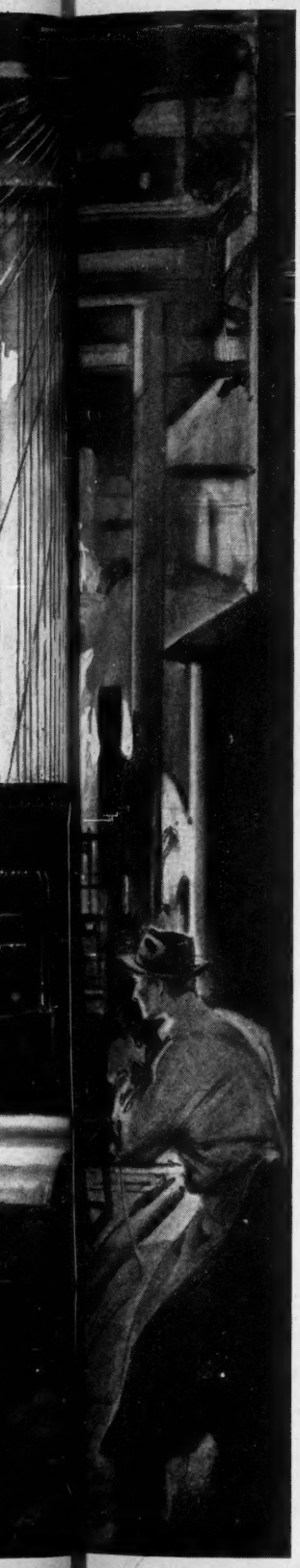
Wire galvanizing unit

FROM AN ORIGINAL DRAWING AND SKETCHES MADE AT J&L ALIQUIPPA WORKS BY ORISON MACPHERSON



STEEL WIRE
HELPS WEAVE PATTERN OF VICTORY

Steel rolled from ingots to blooms, blooms to billets, billets to rods, rods drawn to steel wire, runs a fiery trail as it is processed into one of its most useful forms to serve us in peace and war.

For steel wire enters into the making of so many thousands of articles of daily use that it stumps the experts to count them; plays such an important role in the waging of war that without its aid our armies would be severely handicapped, planes more often grounded, ships circumscribed.

Fortunately for America the steel industry has the raw materials, the coke ovens, the furnaces, the mills, the men, the skill to produce steel wire in vast quantity and in great diversity of sizes and kinds, and of a quality that serves us faithfully.

Knitting together much of the fabric of our civilization — steel wire now helps defend that civilization and waits only upon peace to further enrich it.

JONES & LAUGHLIN STEEL CORPORATION

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PITTSBURGH, PENNSYLVANIA

CONTROLLED QUALITY STEEL FOR WAR AND PEACE

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WIRE FOR WAR

Like a giant loom is the final process in galvanizing steel wire (see illustration) when all the strands come through the zinc bath and are spun bright and strong on the spools.

"Ferritic" welding rod wire, used in welding cast and rolled armor, is a development of the National Research Council in cooperation with J&L metallurgical research and production. Welding results obtainable with this special, high-manganese, ferritic weld rod wire, indicate it will have wide use in welding of many peace-time products.

"Concertina" barbed wire is a new steel product used by the army for entanglements. Produced in the form of a tough, gigantic spring with 4-point barbs every 3 inches on single strand (not two twisted wires) it will stop armored vehicles as well as infantry.

Signal Corps wire, produced by J&L and other steel manufacturers, is a fine galvanized wire with diameter of only 13/1000 of an inch. Four strands of it are wound with 3 strands of copper wire, then covered with insulation and used for battle front telephone and telegraph lines. Copper wire carries message. Steel wire supplies the strength.

330,000 miles of signal wire were strung by American troops in Western Europe alone during first five months after D day. Each month 90,000 additional miles of wire must be supplied Signal Corps in same area.

Recording sound on steel wire has been widely adopted for the war, will have many applications afterward. Small diameter, medium or high carbon steel wire is used to pick up battlefield sounds, accounts of combat operations, reports from reconnaissance pilots. Wire can be "played" many thousands of times without sound distortion.

Woven wire fabric for cots in Army, Navy, Marine and Seabee camps, hospitals, hospital ships, and elsewhere, is made of bright, clean, resilient steel wire, such as J&L Mastercraft, which is also used in coiled steel springs for upholstered furniture.

Barbed wire, guns, rails, windmills, all of steel, made possible swift development of the Great Plains into America's vast supply source of meat, bread and other foodstuffs. Steel repeating firearms made land safe for settlers. Steel rails gave the boundless region easy access to markets. Wells, drilled with steel bits and cable, pumped by steel windmills, furnished water for irrigation and livestock. Finally, barbed wire—thousands of miles of it in this timberless land—enabled segregation of cattle from crops, and the West boomed into prosperity.

Ten-penny nails, six-penny, four-penny, three-penny nails today denote sizes of nails. Long years ago these terms indicated the prices, as nails were sold in England at so many pence per hundred nails by size.

Fig. 1

posed to the atmosphere, a corrosion takes place. Did it not follow, then, there would be no protection. In this case the zinc, being the electro-positive metal, suffers corrosion at the expense of the electro-negative metal, iron. The effect is that the corrosion goes on with the zinc exclusively and the iron is not corroded at all, provided any zinc is left on it.

✦ ✦ ✦

THE reason for the protection of iron or steel by a zinc coating is, therefore, on account of the fact that the zinc corrodes at the expense of the iron or steel by the galvanic action set up. Zinc however, when exposed to the air, does not corrode rapidly or deeply, but in fact, very lightly. This property is of great value, as the zinc coating does not corrode rapidly, even with the galvanic action set up, so that it lasts for a far greater length of time than would naturally be expected. The very fact, however, that the zinc corrodes at the expense of the iron is all that is necessary to protect the iron or steel, even though it be extremely slight.

✦ ✦ ✦

OTHER metals like lead or tin, on account of their not being electro-positive to iron do not act like zinc. They act simply as a covering, like paint or varnish, and if portions of the iron happen to be exposed, even such as a pinhole, the iron begins to corrode. With a zinc coating, however, this will not take place.

✦ ✦ ✦

THE process of galvanizing is first cleaning. The steel is immersed in diluted sulphuric acid, until all the dirt, rust or oxide is removed. Then it is thoroughly washed, dipped in a fluxing acid and brought to the galvanizing kettle. Upon the thoroughness of the cleaning process depends to a great extent the successful results. The work must be presented to the galvanizer as virgin metal uncontaminated by any foreign substance.

✦ ✦ ✦

THE work is slowly immersed in the zinc and permitted to remain until it "thaws out", or comes to the same temperature as the zinc. It is then slowly removed.

✦ ✦ ✦

Pickling

FIGURE 1 shows the building housing the galvanizing shop at the Navy Yard, Portsmouth, N. H. This building is 60 feet wide and 200 feet long. Fifty feet of the far end houses the sand-blasting equipment and 150 feet at the near end houses the pickling and galvanizing equipment.

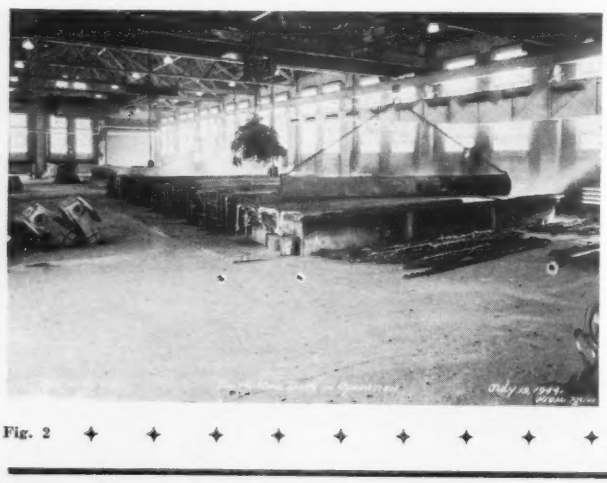

Fig. 2

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BY reference to Figure 2 it will be noted that all equipment has been placed for straight line technique in such manner that the work will travel in a straight line, to, through and out of the pickling equipment and galvanizing kettle.

✦ ✦ ✦

AS seen in Figure 2 the first tub contains caustic soda; the second and third, Sulphuric Acid; the fourth, running water; and the fifth the flux wash.

✦ ✦ ✦

THE technique of operation in the Sulphuric tank is as follows: This tank should be heated and maintained at a strength of from 8 to 10 per cent, percentage by weight, at a temperature of approximately 150 degrees F. and included in this tank an inhibitor for economical operation for the protection of the surface of the steel against over-pickling and the elimination of acid fumes.

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ADDITIONS of free acid are made to this tank continuously to maintain the desired strength until such a time as the iron concentration reaches 4 per cent when no further additions are made. At this point the temperature of the bath is raised somewhat for a short period of time without further additions of acid so that when the tank is emptied it will be rid of free acid.

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APPENDIX I outlines in detail a study on Sulphuric Acid cleaning.

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IF it is found necessary to strip any material for regalvanizing, such pieces are reserved until the time arrives for dumping the Sulphuric tank. The temperature is then raised slightly and these pieces immersed for stripping. The action resulting from this process will kill the acid so that it cannot be used for further pickling. Therefore, any work which needs be stripped should be so stripped just prior to the release of the acid.

✦ ✦ ✦

STRIPPING of the work need only be done if the work has been galvanized for a sufficient length of time to have oxidized heavily, or if the work has originally been incompletely cleaned. Regalvanizing work just

done, because of improper surface coating, needs simply dipping in the flux tank prior to regalvanizing.

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Water

NEXT in line is the water rinse tank. This tank is maintained full of clear clean running water and is a most important step in the cleaning operation because it must remove from the surface of the work all the iron salts resulting from the pickling action of the Sulphuric Acid and present to the flux wash tank material in an absolutely clean condition. This tank may be maintained hot or cold as the exigencies of the technique may require.

✦ ✦ ✦

Flux Wash

THIS last tub contains a solution of zinc salts known as No. 20 Galvanizing Flux. This is a neutral flux that will not contaminate and form dross in the galvanizing kettle as does a muriatic flux wash.

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THE use of neutral fluxes for galvanizing is becoming very popular where the proper technique is thoroughly understood. Proper preparation and use of this new flux is a relatively simple operation and one which will effect, in almost every case, great economies in dross losses in the galvanizing bath. In the use of this flux, wherever the operation is sufficiently continuous, no volatile flux additions to the top of the bath such as sal ammoniac or zinc ammonium chloride is necessary. The carryover of No. 20 from the flux wash tank will maintain any required surface volatile flux blanket desired.

✦ ✦ ✦

IT must be understood that the greatest manufacturer of dross in galvanizing is the salts resulting from the pickling acid. These salts are high in iron and are of such a nature as to rapidly contaminate the fluid zinc and turn it to dross. As a matter of fact, fully 50 per cent of the dross made in the galvanizing operation, where active fluxes are used, is because of these iron salts; 25 per cent of the dross manufactured in many instances, comes from the boiling of the dross because of too low firing, too intense or over-firing

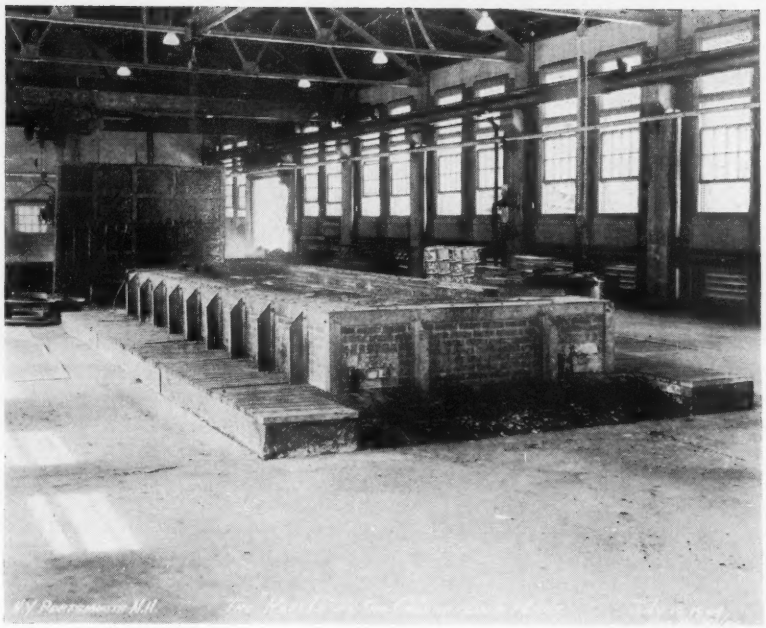

Fig. 3 ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦

of the kettle resulting in a boiling effect in the zinc; 15 per cent of the dross manufactured comes from the work itself passing through the zinc, and 10 per cent from the contamination from the sides of the kettle.

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IT can then be readily seen that if the iron salts resulting from the pickling action are eliminated the dross consumption will be very materially reduced.

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THESE iron salts effect also a widening or thickening of the interlining alloys between the zinc coating and the base iron which results in an improper bond between the zinc and iron, producing an easily flaked or broken coating.

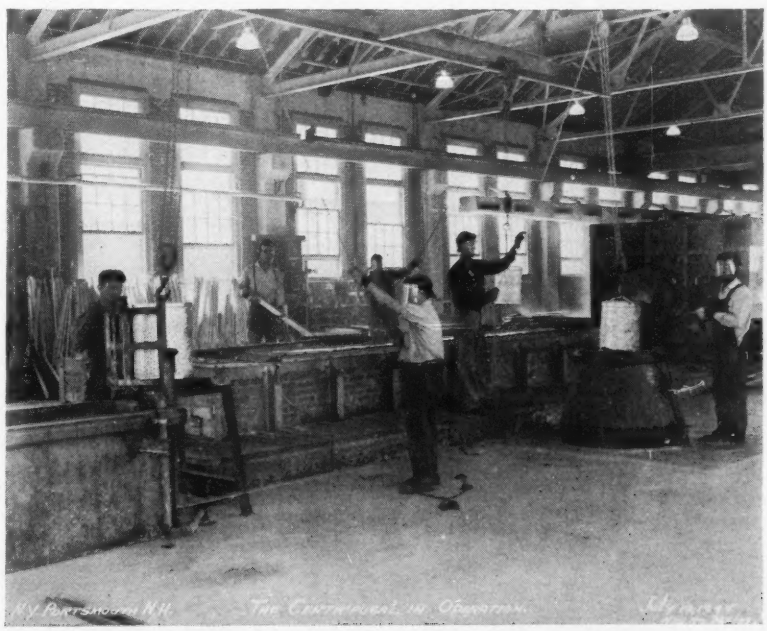

Fig. 4 ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦

IN the use of this neutral flux a very effective reduction in the width of these alloy layers has been found because of the elimination of these iron salts.

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ALL material on which a tight ductile bond is desired should be ordered **fully silicon killed.** This is one of the most important items to be remembered in obtaining tight bond. No aluminum should be used at the open hearth. This demand will probably meet with some resistance from the open-hearth department, but if the desired result is to be obtained it must be insisted upon. The day is past, when any old stock, which cannot be used elsewhere, can be shipped to the galvanizer.

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DETAILS for the use of No. 20 Flux are as follows:

In the first place, the material after pickling must be well washed to remove the iron salts resulting from the pickle. The work must then be promptly immersed in the flux bath before there is a chance for it to rust or dry.

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THE flux bath should be prepared as follows:

A solution of No. 20 crystals should be made in this manner: Figure the gallonage capacity of the tub and add 3 pounds of No. 20 per gallon of water. Then add sufficient No. 20 to bring the reading on a Baume Hydrometer to 28 at 150 degrees F. This temperature and strength should be maintained by additions of water and No. 20.

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IT will be found that very nearly sufficient of this flux will carry over on the work to maintain a volatile flux on the top of the bath. However, in some cases because of the interrupted nature of the work some small additions of No. 20 will have to be made on the bath.

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Effect of Alloy Layers on Bonding

IN every zinc coating operation there forms between the base metal and the pure zinc layer a series of alloy layers. Microphotographs of the zinc coatings show three of these distinct layers. The one nearest the base metal is very high in iron, the middle one still high in iron but somewhat less, and the outer layer considerable lower in iron. These layers, it has been shown, are present in every coating of zinc even though the immersion be for so short a period as 1/20th of a second. These alloy layers are extremely brittle and will fracture the zinc coat upon bending very easily.

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THE particular type of structure of the alloy layers is of importance also. Microphotographic examination of these structures leads to the definite conclusion that the layers must be applied in such a manner as to reveal an even or smooth line of demarcation. If the alloy layers prove to be irregular or tree-like in appearance this irregularity will invariably lead to an easy fracture. The method of introduction of the work into the zinc has much to do with this and is an important reason for the use of a neutral flux as a flux wash.

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IT is also invariably the case that the thinner the alloy layers the more perfect will be the bond between the pure zinc coating and the base metal. The procedure of producing thin alloy layers on zinc coatings is as follows:

1. **The work must be free from iron salts at the time of immersion in the zinc.**
2. **The work after being washed should be protected from any oxidization by the use of a neutral flux.**
3. **This flux must be protected from the burning which results from sudden quench in hot bare spelter by the use of a proper introducing agent (provided for in No. 20 flux).**
4. **The work must be immersed for as short a time as is possible to effect the weight of coating desired and at as low a temperature as is possible.**
5. **The work must be galvanized in pure zinc absolutely uncontaminated by floating dross.**

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Galvanizing

IT is important that all galvanizing be done in clear zinc, uncontaminated in any way with dross, and for this purpose it is recommended that the galvanizing kettle be heated on the sides well above a determined line which may be the part allotted for the accumulation of zinc dross.

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Formation of Zinc Dross

ZINC dross consists primarily of pure zinc which has been contaminated by a small percentage of iron. This iron comes from, to a small degree, off the sides of the kettle, to a small degree from the work which has been immersed, and to a substantial degree from the iron salts produced by an active or improper flux. There is, however, another item of dross formation which is very important because of its influence on the interlining layers, tightness of bond, and life of equipment. The steel kettle in which the zinc is melted must not be placed in the furnace in such a way as to restrict to a limited area the heat application. Likewise the kettles must not be installed in a furnace in which the heat is applied from below or too low a point on the sides of the kettle so as to effect a boiling action in the dross. It is also important in any molten metal operation of this kind that sufficient capacity be provided for in the body of the metal itself so that there is not too rapid a transfer of heat.

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AS the zinc becomes contaminated by iron it settles of its own gravity to the bottom of the kettle and in order to galvanize in pure zinc the furnace must be designed as to not only allow but to assist this natural precipitation of contaminated zinc to the bottom of the kettle without interference.

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BY applying heat to the bottom of the kettle or producing a heat input over too restricted an area, there will be an interference with the natural settling of the dross, with the result that it floats the dross again and places back upon the work a considerable quantity of drossy zinc. This drossy zinc affects materially the formation of the alloy layers and places upon the work a coating of poor quality.

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ACCEPTING then, the fact that the heat should be applied constantly and evenly over a wide area of the sides of the kettle and not from the bottom or concentrated upon too restricted an area, the designer must not stop there. The greatest amount of heat, as a matter of fact, should be applied to the upper portion of the sidewalls of the kettle where the greatest heat is taken out. Less heat at the lower portions and little or no heat below a determined line allowed for the accumulation of zinc dross.

IN this connection it may be noted that at the Navy Yard Norfolk, Virginia a conversion from a small under fired, under capacitied galvanizing kettle using an active flux wash and resulting in a 59 per cent dross loss over pure zinc added, to a furnace of proper design and using neutral flux resulted in a reduction in dross loss to 14 per cent. In other words, out of every 100 pounds of pure zinc added to the old furnace 59 pounds had to be dug out of the bottom of the furnace as dross and sold at a loss, but in the new furnace only 14 pounds was lost.

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FIGURE 3 pictures a correctly designed galvanizing setting. The steel kettle itself is built of 1¼ inch fire box steel plate and is of welded construction. It is 20 feet long, 44 inches wide and 48 inches deep and holds approximately 140,000 pounds of pure zinc.

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THE furnace surrounding the kettle (Figure 4) is lined with 4½ inch first quality firebrick, the insulation is of 2½ inch 1600 degrees F. insulating brick and the casing is 4 inch of standard red brick reinforced with structural steel shapes.

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FIRING is accomplished by a series of tunnel type impact burners designed for Propane gas at 6 to 7 inch 10 C. pressure. Air for combustion is supplied by a #316-E2-7-½ blower complete with motor and starter to supply a constant pressure at 1 lb.

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TEMPERATURE control is accomplished by two-zone automatic equipment consisting of 2-Wheelco #221 Indicating and Controlling Pyrometers hooked to two Iron Constantin Angle Type Thermocouples encased in special protecting tubes.

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THIS furnace controlled in this manner will maintain the zinc at 860 degrees F. under any reasonable conditions.

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THE equipment thus outlined has been in complete operation since 1 February 1944 and up to 1 July 1944 (5 months) had galvanized over 2,000,000 pounds of work with a complement of 13 men. The work was classified as follows:

	Pounds
1. Fabricated sheet metal work	170,519
2. Plates and shapes, both fabricated and plain	1,519,197
3. Nuts, bolts, studs and forgings	225,773
4. Pipe, bent and cut to shapes	153,266
Total	2,068,773

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Centrifugal Galvanizing

ONE of the most successful and satisfactory features of the modern galvanizing plant is the production of high grade centrifugal work through the use of a well designed centrifuge. Figure 4 pictures such equipment in use at the Navy Yard, Portsmouth, N. H.

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THE centrifuge shown is a Barrett #402G Centrifuge galvanizer. This machine operates at 900 Rpm. and reaches a maximum speed in ten seconds. It receives a 160 pound gross basketful of material every 90 seconds, and throws off in 30 seconds, all excess material from threaded parts that must remain movable.

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BESIDES threaded nuts and bolts and various small articles otherwise difficult to handle, much of the work centrifugally galvanized consists of various parts going into the construction of blocks manufactured by the Yard. These parts consist of assemblies of single, double and treble blocks of various sizes from 4 inches to 24 inches all of which contain snatch block fittings, swivel hooks and swivel fork shackles, one to five in number, needing to turn freely after galvanizing.

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FORMERLY a long and expensive hand operation was necessary to free frozen zinc, involving the use of four men to burn, swing sledge hammers and manipulate with crowbars the movable parts. The result was chipped and burned surfaces and the galvanized coating was nullified. Manhours, oxygen gas and zinc were wasted.

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THE strict technique of operation in centrifugal galvanizing must be followed.

AS will be seen in Figure 4, perforated steel baskets are used as a container for the material. After loading, the baskets are slowly lowered into the zinc through a volatile bath blanket. One basket follows the other to the out-go end.

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THE volatile blanket is then skimmed back and the basket quickly swings to the centrifugal. Only the shortest possible time must be consumed between the exit of the basket from the zinc to the full speed of the centrifugal so as to permit little or no setting of the zinc before the machine attains full speed.

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AFTER completion of the spinning operation the basket is again quickly lifted from the centrifugal and transferred to the tilter shown at the left of Figure 4 where it is upset and the work quenched in water covered with a light film of a good grade of quenching oil.

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THE installation of modern, adequate galvanizing equipment at various Navy Yards has effected a concrete contribution to efficiency and economy. Rush orders are handled immediately, very urgent materials can be turned out in fifteen or twenty minutes. Large quantities of rush material move to the head of the work list for the day and in no instance do more than a few hours elapse between receipt and delivery.

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APPENDIX I
Investigation on Use of Sulphuric Acid for Pickling

THE following investigation was conducted for the purpose of determining the effect of the concentration of sulphuric acid on the time of pickling.

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Method of Procedure

SHEETS of 20 gauge standard enameling steel measuring 4 inches by 6 inches were annealed at 1400 degrees F. for 2 minutes in an electric furnace. Three samples of each were then pickled in sulphuric acid of the following concentration:

1-15 per cent inclusive, 20 per cent, 25 per cent, 30 per cent, 40 per cent and 50 per cent, and at temperatures 77 degrees, 105 degrees, 120 degrees, 150 degrees, and 180 degrees F.

(Please turn to page 451)

Developments in Wire and Cable Coatings

By Carl Bauer,

Research Chemist, Standard Varnish Works,

War developments have established requirements for wire and cable with low temperature flexibility, high heat stability, moisture and fungi resistance, oil and gasoline resistance, together with excellent electrical characteristics. A discussion of coatings to meet such requirements is presented here. ✦

THE steady progress made by the protective coating industry within the last few years, has reflected itself in the highly specialized field of wire and cable coatings. Modern developments in our plastics and synthetic rubber industry also have contributed to a large extent toward a better understanding of the problems involved in the formulation of materials, which must meet the most rigid requirements. Since the outbreak of the war much has been learned about new and different factors, which caused wire breakdowns and thus resulted in limited length of service of vital war equipment.

✦ ✦ ✦

THE enormous expansion of our airplane industry, coupled with the adoption of mechanized warfare, brought about new and severe conditions which had to be met. With our troops operating in every part of the world it was necessary to produce equipment designed to handle flawlessly, regardless of temperature or atmospheric conditions. Low temperature flexibility, high heat stability, moisture and fungi resistance, oil and gasoline resistance, together with excellent electrical characteristics, were established as basic requirements for a satisfactory wire and cable finish.

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PERFORMANCE Specifications were set up by various government agencies to obtain uniform and approved materials. In order to meet these tests successfully, it was necessary to conduct a careful study of the behavior properties of available raw materials under all conditions of use. The globular scale of this war has provided us with the opportunity to test these finishes over a wide range of temperatures, humidities and stresses. The development of high-altitude flying brought about unusual conditions, especially sudden and wide temperature changes, varying from —70° F to 180° F, which are the cause of rapid deterioration and wide changes in the physical properties of organic synthetic materials.

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OUTDOOR weathering and ultraviolet exposure, as well as high humidity, have a definite influence on the performance, permanence and life of an organic coating. The introduction of jungle warfare proved the inadequate protection of our materials against fungus growth. Equipment which was designed only for normal use, failed, sometimes completely, after a number of hours of exposure in the tropics.

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AFTER several years of research it was found that hardly any organic material was safe from fungal attack, which may vary in effect from surface growth to complete destruction. It became imperative to incorporate an efficient fungicide into protective coatings, which had to be compatible with the synthetic chemicals and plastics used. The basic requirements of such a fungicide are:

1. **Inherent effective toxicity against the combined actions of the types of fungal organisms found in the tropics.**
2. **Safety in handling to prevent dermatitis or ill physical effects.**
3. **Permanency and non-volatility, as well as water insolubility, in order to withstand weather exposure, high temperatures and abnormal humidity.**
4. **Inertness in respect to electrical characteristics of cable coatings.**

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THESE factors have to be taken into consideration before incorporating a fungicide into a cable finish. A large amount of our equipment, especially in communications, contains various types of wire and cable, which are essential for its proper functioning in service. The addition of a fungicide in the protective coating thus insures the cable against a breakdown which might cause serious delays and endanger many lives.

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A CABLE normally consists of the conductor, the insulation and a fibrous covering, followed by a protective coating. The ultimate performance of a cable will depend on a well balanced construction, proper braid and suitable coating. The insulating material is usually the limiting factor in the capacity of the cable. Though a lot of research work has been done to combine both insulation and protective covering into a single material, the introduction of high powered motors and high voltage application made this a highly difficult problem.

✦ ✦ ✦

A DESIRABLE insulating material should have high dielectric strength, low power and loss factor, good heat stability and low water absorption. It is well known that natural rubber provides excellent insulation, but it is also easily affected by gasoline, oil, high temperatures and oxygen, which makes a surface coating necessary. Modern developments in plastics, elastomers and synthetic rubbers have helped considerably to overcome most of these drawbacks, but other difficulties, such as low softening point, or excessive cost have limited the use of these plastic compounds.

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THE coating industry has been working very closely with the cable manufacturer to extend the life and the capacity of a cable, by providing it with a tough and durable

protective finish. The increased use of plastics and a vast amount of research work within the last few years has established the paint and varnish industry on a scientific basis, with a knowledge that will enable it to formulate materials, whose behavior can be predicted under a set of given conditions.

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IT would be beyond the scope of this article to discuss all the various finishes that are used by the cable industry today. The coating industry manufactures all types of impregnating solution coatings, hot melt coatings, varnishes and lacquers. Some of the raw materials used are asphalts, pitches, waxes, oils, all types of resins and organic and inorganic chemicals.

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THE development of high polymer chemistry and the steady progress of the plastics industry have established these organic chemicals as basic raw materials for industrial specialty finishes. These synthetic plastic materials may be divided into two broad classifications.

(a) Thermoplastic materials, which soften with heat and solidify on cooling, but which can be reheated and reformed.
(b) Thermosetting resins, which cure with heat and form finished infusible and insoluble products.

✦ ✦ ✦

THE drying process of a coating can take place by several different means, namely:

(a) Evaporation of the volatile solvent
(b) Oxidation
(c) Polymerization, and
(d) Condensation

✦ ✦ ✦

THERMOPLASTIC materials usually dry by evaporation, while coatings made from oils and synthetic resins dry by oxidation, polymerization, polycondensation or a combination of these reactions.

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OXIDATION usually occurs in oil paints and is a slow process where the drying of the film depends on its ability to absorb oxygen from the air to convert to a solid film.

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POLYMERIZATION has been defined as the union of like molecules to form a product of the same composition. In other words, the polymerized material contains the same elements and in the same proportions, but has a higher molecular weight. In a condensation reaction, however, the polymerized synthetic has no longer the same composition as its simple starting material (Monomer).

✦ ✦ ✦

POLYMERIZATION and condensation are usually accomplished by a combination of two methods:

(a) addition of a catalyst
(b) application of heat

✦ ✦ ✦

THE amount and type of catalyst used, as well as the reaction temperature, will influence the speed of these reactions. Generally speaking, polymerization applies to thermoplastic materials, such as vinyl resins, while thermo-setting finishes, such as ureaformaldehyde and phenolformaldehyde, fall into the condensation reaction category.

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UNMODIFIED thermosetting finishes have excellent heat resistance, chemical resistance and hardness but they usually exhibit poor elongation and flexibility, even at normal operating temperatures. On examining the structure of a film of this nature, we find that molecular cross-linkage has taken place, which is indicative of a thermosetting material and low flexibility. These materials are used very little in cable coating finishes due to their rigidity and difficult application procedure.

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THE large family of thermoplastic synthetics is well known to the cable manufacturer through their use as extrusion materials for primary insulation.

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THE main drawback of these materials is their low softening point and the loss of their mechanical usefulness at elevated temperatures. The molecular film structure of thermoplastic materials is composed of straight chain or linear polymers which vary in length and composition and thus determine the final physical properties of the compound. Though thermoplastic materials have inherently more flexibility than thermosetting materials, due to their molecular structure, they differ widely in mechanical characteristics and other properties. Thus polystyrene is commonly known as a brittle thermoplastic synthetic, while ethylcellulose is an outstanding example of a tough material. Nylon, modified polystyrene and the vinyl resins are used extensively at present for electrical insulation purposes by extrusion molding.

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IN the coating industry the different members of the thermoplastic cellulose derivatives are most widely used and are generally known as lacquers. The plastics, based on cellulose, are all made from a chemical modification of the purified material, and are known as nitrocellulose, cellulose acetate, cellulose acetate propionate, cellulose acetate butyrate and ethyl cellulose. The cellulose molecule consists of long linked chains, which have great strength and thus provide toughness and flexibility for its derivatives. A close comparison shows a wide variation of properties amongst cellulose esters and ethers by varying the kind and amount of the substituent groups. It was discovered that the viscosity of cellulose derivatives was a direct function of their chain length, in other words, the strength properties increased with viscosity up to a certain point, above which the difficulty in handling did not balance the increase in strength. This control of viscosity, together with the rapid drying and ease of application, brought about the rapid development of the lacquer industry.

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FOR actual use these cellulose derivatives are compounded with plasticizers, resins and pigments and applied as viscous solutions, which dry by evaporation of the volatile solvent and deposit a film, which shows excellent durability, toughness, flexibility and has good electrical characteristics over a wide range of temperatures, if modified properly. All environmental factors have to be considered according to their importance, as their combined effect will be more destructive than any single factor. Plasticizers are liquids with low vapor pressure and are added to increase elongation and flexibility. Syn-

thetic resins, such as alkyds, are added to improve adhesion, gloss, toughness and chemical resistance. The evaporation rate of the solvent used, determines the drying rate of the lacquer and has to be carefully balanced, especially for cable lacquers on a tower application. The volatile portion of the coating should evaporate quickly without adversely affecting flow and compatibility of the lacquer, in order to avoid blistering on recoating, due to trapped solvent.

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DIFFERENT types of cable lacquers are manufactured today for low tension primary wire lacquers, such as aircraft and radio hook-up wires, and for high tension ignition cable coatings used on automobiles, tanks, airplanes and high compression motors.

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A THOROUGH investigation on the performance of a cable, especially on fungi resistance and on moisture absorption tests, established the necessity of using a saturant for a fibrous covering (cotton, rayon or glass) which provides the necessary impregnation and thus forms the basis for a protective film that will meet all the necessary requirements.

✦ ✦ ✦

IMPREGNATION depends upon the viscosity, the solid content and the wetting ability of the saturant. A quick drying, low viscosity solution, containing the proper fungicide and providing excellent water resistance, heat stability and flame resistance will give the best results.

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THE main requirements of a low tension primary wire are flame resistance, mild heat resistance, abrasion resistance, flexibility, water resistance, moderate dielectric strength, and in most cases ink-blurring and fungus resistance. The performance of the finished wire especially for fungi resistance will depend to a large extent on the thickness of the film deposited, which means that the cable manufacturer has to apply about 6-9 passes in order to obtain a satisfactory wire. The most economical method to build up film thickness is by means of a high-solids Lacquer, which will require fewer passes at a lower solvent-loss.

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FOR the formulation of a satisfactory primary wire lacquer, it is possible to use any type of cellulose derivative providing they are modified properly. Off hand, it would appear rather hazardous to use the highly inflammable cellulose nitrate as a basis for a flame resistant cable lacquer, but after months of research such lacquers have been developed, furnishing all the advantages of Nitrocellulose plastic, such as quick solvent release, economy, availability, superior water resistance, abrasion resistance and hardness. Nitrocellulose however, is more sensitive to light and heat than the other cellulose compounds. Cellulose acetate is remarkable for its low flammability and excellent oil resistance, but shows high water sensitivity due to its hygroscopic nature, and the lack of compatible modifiers limit the possibilities of this material. The cellulose mixed esters have properties approaching nitrocellulose, combined with good light and heat stability, but are still rather costly on a competitive basis with the cellulose nitrate.

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WHILE the primary wire lacquer coating has to meet some stringent requirements, the high tension cable finish has to stand up under far more severe tests. It has to have enough flame resistance to extinguish itself after being ignited. The coating also has to withstand a 40 hour hot oil (about 240°F) immersion test to protect the insulation, after which it still has to meet the original flexibility and electrical requirements. It must also retain its flexibility and pass a mandrel bend test after several hours exposure at —50°F. The high-heat stability of the finish is tested by submitting the cable to a bend test after exposure at 375°F for 20 hours. The resistance of the finished cable to the absorption of moisture is determined by the so called "High Potential" test, which is a high voltage test performed after immersing the cable for a specified time in hot water (about 180°F). Besides the necessity of passing these physical tests, a high tension lacquer also has to contribute high dielectric strength and high resistance to the effect of ozone produced by high voltage discharges (corona resistance) to the primary insulation. It is obvious, that it is necesary to build up a heavy film of approximately 10-15 mils. to provide the utmost protection for the insulation and produce a satisfactory cable. The cable manufacturer today applies about 20-30 coats of lacquer on high tension cables to obtain that necessary film thickness.

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IT has been found that certain lacquers will work only in combination with specific compounds, used for insulation and certain methods of braiding, etc. It has therefore reached a point where cable lacquers have to be "tailor-made" and individually formulated to meet the technical specification of the manufacturers. The introduction of ethylcellulose has provided the lacquer industry with a new raw material, especially fitted for ignition cable lacquer. This cellulose derivative is distinguished by its versatility, low flammability, toughness, compatibility, dimensional and heat stability and flexibility over a wide range of temperatures. The final performance of the lacquer, however, will depend on the choice and proportions of the cellulose derivatives, the plasticizers and the addition of other modifying compounds.

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THE formulation of these unusual lacquers has become a highly specialized field in the lacquer industry, where both an intimate knowledge of raw materials, as well as a thorough understanding of the problems of the cable manufacturers has become necessary, in order to develop protective coatings to improve the life and performance of a cable. Development and research work is constantly carried on in the Laboratories of the cable manufacturers and the lacquer manufacturers to create a product that will combine both economy and quality.

EDITOR'S NOTE

Credit should have been given to "Mining and Metallurgy" of January 1945 for the article run in our May issue entitled, "Research, Patents and the Kilgore Bill' by Anthony William Deller.

GOVERNMENT WIRE PRODUCTION INFORMATION

War Production Board

AS a result of new urgent military programs requiring large quantities of tungsten, the use of the metal in high speed tool steels again will be restricted through the issuance of Order M-21-j, the War Production Board said recently.

✦ ✦ ✦

PROVISIONS of the new order will follow closely the requirements of the old order, M-21-h, which was revoked on August 21, 1944, except that in the new order the melting and deliveries of high speed steel must be in the proportion of 85 per cent of Class A and 15 per cent of Class B high speed steel as compared with 75 per cent Class A and 25 per cent Class B in the old order.

✦ ✦ ✦

CLASS A high speed steel has been defined as any alloy steel containing not less than .60 per cent carbon and 6.75 per cent or less tungsten, and more than three per cent molybdenum.

✦ ✦ ✦

CLASS B high speed steel is any alloy steel containing not less than .55 per cent carbon and more than 12.0 per cent tungsten.

✦ ✦ ✦

DURING the period in which the restrictions on melting were in effect, the substitute molybdenum steel (Class A) caused little or no inconvenience or production loss in the plants using high speed steel, WPB officials said. It will only be a matter of re-education and possibly a change in some orders to get the tool steel users to use Class A as a substitute for the restricted grade, Class B.

✦ ✦ ✦

OFFICIALS of the Steel Division's Alloy Branch expect that through the new order they will be able to meet the increased military needs and maintain an adequate reserve supply. They also said that the restrictive provisions on melting would be revoked when tungsten reserves had reached a safe level and all military requirements had been safely met.

✦ ✦ ✦

Stainless Steel

STAINLESS steel has been redefined in a newly-amended M-126 order to bring it into conformity with the stainless steel definition in the steel order M-21-a, the War Production Board announced.

✦ ✦ ✦

IN the amended order, the term "stainless steel" means heat or corrosion resisting steel containing four per cent or more of chromium with or without nickel, molybdenum or other elements.

✦ ✦ ✦

Metal Strapping

BECAUSE the demand for metal strapping was exceeded the sup-

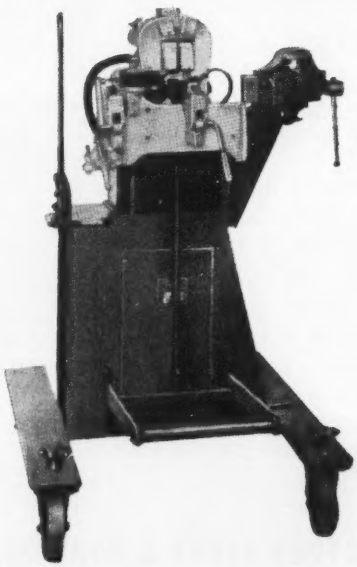
(Please turn to page 432)

MICROMETER PRECISION MICRO-WELD TRADE MARK REG. U. S. PAT. OFF.

CONTINUOUS IMPROVEMENT

MICRO-WELDERS with dial indicating annealing attachments are now available for high carbon wire.

There is positive control of annealing temperature and already hundreds of these special MICRO-WELDERS are proving their dependability and satisfactory performance with leading manufacturers.



MICRO PRODUCTS COMPANY

20 NORTH WACKER DRIVE, CHICAGO 6, ILL.

Telephone, State 7468

More and Better Victory Gardens

The Easy GARDEN RAISER*

made with KEYSTONE Wire

EVERY garden today is a food arsenal . . . vitally important for replenishing our depleted food supplies. In thousands of victory gardens you find the Easy Garden Raiser* performing sterling duty. This favorite cultivator is ten times faster than a hoe . . . much easier to use . . . saves valuable time.

The efficiency of the Easy Garden Raiser* is matched by its sturdy construction . . . reason enough why durable Keystone wire is used. Whatever the wire need, Keystone wire "fills the bill."

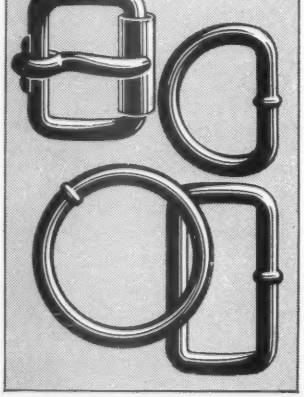
*"Easy" and "Dandy Boy" Garden Tools are manufactured by The Midland Company, South Milwaukee, Wisconsin.

KEYSTONE STEEL & WIRE CO.

PEORIA 7, ILLINOIS

WAR PRODUCTS

Keystone wire finds its way into numerous buckles, rings, and other hardware for life jackets, rifle scabbards and other materiel . . . also manufactured by The Midland Company.



Special Analysis Wire for All Industrial Uses

SAMSON SPRING WIRE — REG. U.S. PAT. OFF. — KEYSTONE STEEL & WIRE CO. PEORIA, ILL.

Coppered, Tinned, Annealed, Galvanized

Government Wire Production Information

(Continued from page 431)

ply, it has been necessary to issue a preference rating order, P-152, to insure that the most essential needs are taken care of first, the War Production Board reported.

✦ ✦ ✦

THE order permits any person to use an AA-1 rating to obtain metal strapping for the functional uses: carloading, skidloading, baling and bundling. Strapping used for these purposes conserves or replaces critical lumber, nails, bolts, paperboard, labor and shipping space, the Containers Division pointed out.

✦ ✦ ✦

ORDER P-152 also permits persons who use metal strapping for container reinforcement to use the rating assigned for the container it reinforces in accordance with Preference Rating Order P-140 (wooden shipping containers) and P-146 (fiber shipping containers). It also permits use of an AA-5 rating for procurement of reinforcement edgings.

✦ ✦ ✦

PREFERENCE ratings assigned or permitted to be used by P-152 may be applied or extended to any unfilled order for strapping tools, accessories or fittings placed prior to April 6, 1945. However, all orders for metal strapping placed prior to April 6, 1945 must be re-rated in accordance with the new order within a period of forty-five days.

✦ ✦ ✦

A CERTIFICATION form is provided for use in applying or extending ratings assigned or permitted by the order. Inventories in the hands of persons other distributors, manufacturers or the Army or Navy are limited to $300 worth of strapping, or a 45 days' inventory, whichever is greater.

✦ ✦ ✦

Insect Screen Production Increased Through Change of Design

PRODUCTION of metal insect screen cloth urgently needed by the military and for civilian use will be increased approximately 20 per cent by use of a rectangular instead of a square mesh. This change in specifications can be made with only minor adjustments in weaving facilities.

THOUGH the new mesh is a radical departure from the metal insect screen cloth industry's long-standing practices, it is being placed in production as rapidly as possible and has the whole-hearted approval of the industry as a war emergency measure.

✦ ✦ ✦

THE new type of screening substitutes an 18 by 14 mesh (18 wires per inch in the warp and 14 wires per inch in the woof) for the two specifications heretofore predominantly required by the military, 18 by 18 and 16 by 16 mesh. "Bug stopping" tests of the 18 by 14 mesh screening have been carried on by the Bureau of Entomology, Department of Agriculture. The Surgeon General's office is satisfied, on the basis of these tests, that the new mesh is an adequate barrier against mosquitoes and other undesirable insects, and has approved its use by the War Department, WPB officials said.

✦ ✦ ✦

USE of the 18 by 14 mesh, in addition to permitting increased production of this critical product, is expected to effect a saving of about 11 per cent in the metal per 1000 square feet unit required in former military specifications of 18 by 18 mesh bronze screening. Another advantage is the elimination of producing and stocking two separate meshes for military orders. Use of 18 by 14 mesh has been approved by the War and Navy Departments, and military specifications have been changed accordingly. The new mesh is considered a satisfactory substitute for 18 by 18 mesh and a better protection against insects than the 16 by 16 mesh.

✦ ✦ ✦

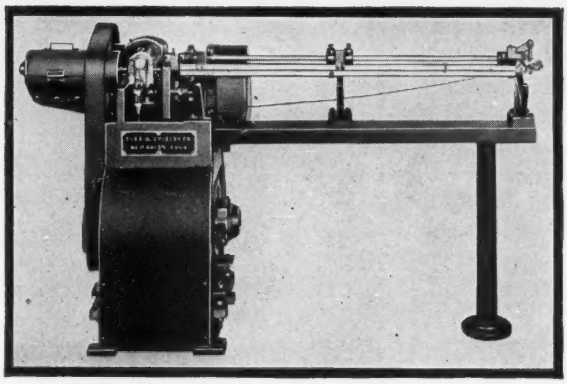
SCREENING for civilian use is now limited to 12 by 12 and 16 by 16 mesh under Order L-303. It is expected that the order will be amended to require manufacture of 18 by 14 mesh for civilian use in place of the present 16 by 16.

✦ ✦ ✦

New Bulletins Issued by ACP

AMERICAN Chemical Paint Company, Ambler, Pa., has published two new technical service data sheets covering Deoxidene, a chemical that removes rust and cleans metal surfaces for painting. Please ask for Nos. 3-1-1-2 and 3-2-210 2.

(Please turn to page 434)



SHUSTER WIRE STRAIGHTENER TYPE A
Wire Capacity 1/32" - 1/16" Diameter

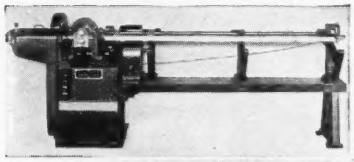
Faster Cutting Speeds
GREATER PRODUCTION!

✦

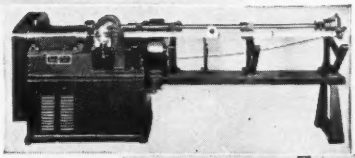
Outstanding Features—

Almost continuous wire travel
Lightning cut-off assures square-cut ends
High speed, direct driven 5-die straightening flier
Quiet, highly efficient V-belt motor drive
Ball and roller bearings throughout
Extremely rigid construction
Fully guaranteed as to material and workmanship

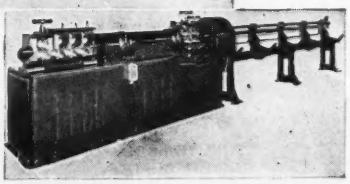
New descriptive folder on request



Type 1A
1/16" - 3/16"
Dia.



Type 2A
1/8" - 1/4"
Dia.



Type 3A
3/16" - 3/8" Dia.

Type 4A (not shown)
3/8" - 5/8" Dia.

The F. B. Shuster Mfg. Co., Inc., New Haven, Conn.

SHUSTER
Automatic
WIRE STRAIGHTENING
AND CUTTING
MACHINES
Since 1866

Government Wire Production Information

(Continued from page 433)

WPB Frees Western Copper Wire Mill Warehouses from Replacement Order Restrictions

COPPER wire mill warehouses located in California, Oregon, and Washington, have been freed from the limitation restricting the amount of their replacement orders in any month to 25% of deliveries from warehouse stock during the second quarter of 1945. This action was taken in an amendment to Direction 4 to C.M.P. Regulation 4, effective May 1, 1945.

✦ ✦ ✦

THE limitation still applies to warehouses in other areas of the country. W. P. B. explained that warehouses on the Pacific Coast have been released from the restriction at this time because of the imminent shift of emphasis to the Pacific war which will result in greater dependence upon these warehouses by the services than has been the case in the past. Because of transportation handicaps, it is necessary that the Pacific Coast warehouses be given the edge now in acquiring adequate stocks to meet emergencies that may develop with the end of the war in Europe.

✦ ✦ ✦

Brass Mill Production in First Quarter Highest In History

ACCORDING to statistics released by W.P.B. Copper Division, brass mill production during the first quarter of this year, as a result of the greatly expanded ammunition program, reached a new all-time peak of 1,459,382,000 lbs., metal weight. This compares with 1,174,233,000 lbs. in the preceding quarter 1,337,605,000 lbs. in the corresponding quarter of 1944, and with 1,404,093,000 lbs. in the first three months of 1943. The figures reveal, further, that the establishment of the new peak in the first quarter of this year was made possible by the fact that during the month of March production for the first time exceeded half a billion lbs., amounting to 517,539,000 lbs. as against only 464,000,000 lbs. in February and 447,843,000 lbs. in January. The closest approach to the record was in March 1943.

Tire Chain Production Facilities Being Expanded

MEMBERS of the Tire Chain Industry Advisory Committee recently requested War Production Board officials to investigate the necessity for new facilities now under construction. The industry members said, is now meeting its schedules for tire chains and questions the advisability of continuing with the plans for expansion.

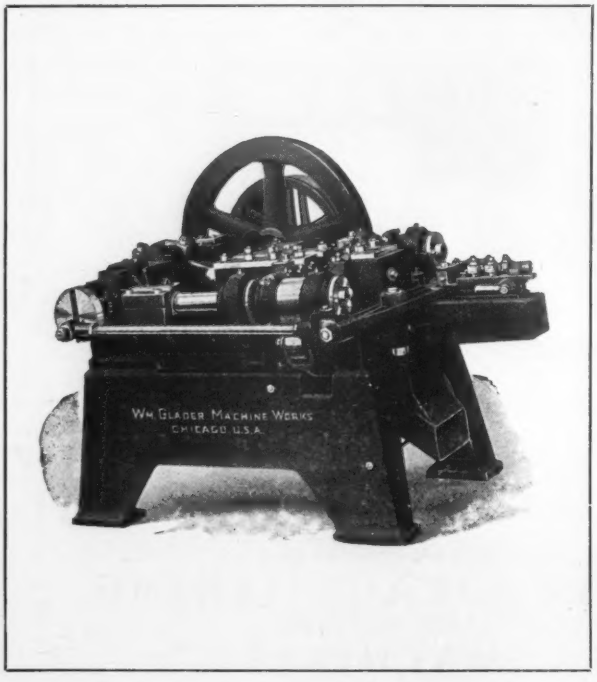
✦ ✦ ✦

PREVIOUSLY, the lag in tire chain production had seemed to warrant the construction of the new plants. The last few months, however, have seen a change in the situation and the tire chain industry, feeling that it is now "out of the woods", is asking WPB to explore the subject in light of present conditions.

✦ ✦ ✦

THE new plants cannot be expected to go into production for months and with the facilities now in operation, if material is made available, the industry is confident of its ability to handle all orders.

GLADER HIGH SPEED WIRE NAIL MACHINE



High tonnage output, and low maintenance costs, have resulted in Glader Machines being accepted as standard equipment in every large nail mill built in the United States in the past twenty years.

Glader Machines are operating in most of the wire producing mills throughout the world.

These machines are made in eleven different types and sizes. This enables us to cover the range of sizes of nails produced with the greatest efficiency.

For further information please address,

WM. GLADER MACHINE WORKS

210 NO. RACINE AVE.
CHICAGO, ILLINOIS

Brass Mill Production

PRODUCTION of alloyed and unalloyed brass mill products, as reported by the War Production Board (Copper Division) in thousands of pounds, metal weight.

	—1943—	
	1st quarter	total yr.
Plate, Sheet and Strip	958,582	3,994,819
Rod and Wire	256,843	943,870
Tube	79,052	287,490
Total Alloyed	1,294,477	5,226,179
Unalloyed Products	109,616	383,847
Total All Products	1,404,093	5,610,026

	— 1944 —		
	1st quart.	4th quart.	total yr.
Plate, Sheet and Strip	919,604	710,707	3,272,928
Rod and Wire	244,315	271,997	1,018,479
Tube	78,132	87,071	326,745
Total Alloyed	1,242,051	1,069,775	4,618,152
Unalloyed Products	95,554	104,458	395,048
Total All Products	1,337,605	1,174,233	5,013,200

	— 1945 —			
	Jan.	Feb.	Mar.	1st quart.
Plate, Sheet & Strip	305,914	300,543	334,250	940,707
Rod and Wire	101,149	98,656	110,270	310,075
Tube	33,542	30,213	35,365	99,120
Total Alloyed	440,605	429,412	479,885	1,349,902
Unalloyed Products	37,238	34,588	37,654	109,480
Total All Products	477,843	464,000	517,539	1,459,382

✦ ✦ ✦

Communication Wire Production Up

MARCH production of copper communication wire increased 22 per cent to a new record total of 267,000 miles, which elicited a tribute from the Army Signal Corps on the industry's splendid performance, War Production Board officials informed members of the Copper Wire Mill Industry Advisory Committee at a recent meeting.

COMMUNICATION wire production in March was divided into 185,000 miles of field wire, 64,000 miles of assault wire and 18,000 miles of W143 (heavy wire). The field wire and W143 represent the more permanent types of communication wire, but it is assault wire that is used in the bulk of the front lines' communication systems.

✦ ✦ ✦

THE assault wire, which was described by one field general as "24-hour wire" because it is so expendable, must be provided in ever increasing quantities, Copper Division spokesmen said, to meet Signal Corps requirements. WPB officials and committee members agreed that this production could be increased but it was pointed out that the supply of solyethelyne must be increased to meet the proposed production.

✦ ✦ ✦

WPB officials also disclosed new demands for fine wire between 25 and 36 gauge. Industry representatives reported lack of manpower for these increased operations but WPB officials pointedout that many copper mills had failed to apply to the Area Production Urgency Committee for a sufficiently high labor rating to enable them to recruit additional workers.

You Can't Beat HUBBARD DRUMS and TRAVERSES
No matter what size you specify — from 6" to 60"— in plain, painted or hot galvanized finish — there is a Hubbard drum or traverse* for every type of reel you use. In each, you'll find the workmanship and quality that has kept Hubbard products at the top since 1912.
Write today for prices and delivery details. Drums and traverses are shipped from our Garrett, Indiana, Division.
*Under license arrangement with the Western Electric Company, Inc.
ARMY E NAVY
HUBBARD SPOOL COMPANY
1624 CARROLL AVENUE | CHICAGO 12, ILLINOIS
Since 1912, manufacturers of wire drawing and annealing, and shipping spools and reels.
PLANTS AT CHICAGO, ILLINOIS AND GARRETT, INDIANA

A Review of Recent Wire Patents

No. 2,372,645, GUIDE FOR APPLYING INSULATION TO CONDUCTORS, patented April 3, 1945 by Boris J. Barmack, Chicago, Ill.

✦ ✦ ✦

The guide is adapted for applying tape about a wire conductor and pressing the tape into contact therewith. There are 14 claims.

✦ ✦ ✦

No. 2,373,775, WIRE SPRING STRUCTURE FOR SEAT AND BACK CONSTRUCTION, patented April 17, 1945 by William H. Neely, Cleveland, and Svend G. Blumensaadt, East Cleveland, Ohio, assignors by mesne assignments, to The Universal Wire Spring Company, Cleveland, Ohio, a corporation of Ohio.

Complete Descriptions and Drawings of Patents May Be Had for 25 cents; outside United States and Canada, $1.00. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.

✦ ✦ ✦

Sinuously corrugated wire springs, having paralleling top and bottom portions and inclined connecting portions lying in the same plane throughout their extent, are connected in axial alignment with each other.

✦ ✦ ✦

No. 2,374,133, APPARATUS FOR MANUFACTURING WIRE ROPE, patented April 17, 1945 by Emil Ramstedt, New Haven, and Daniel D. Symmes, West Haven, Conn., assignors to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

✦ ✦ ✦

This assembly includes a rotary flier, carrying a number of reels of strand, a stationary strand die, the flier carrying an adjustable twister head equipped with a number of lay plates one of which is fixedly secured to the flier and the other of which is slidably supported by the fixedly secured one of each of these lay plates having a number of tube-like wire or guide appertures, the fixedly secured lay plate having a number of openings adjacent the apertures therein and corresponding in number to the wire guiding apertures of the slidably supported lay plate, and means for holding the lay plates in various positions of adjustment.

✦ ✦ ✦

No. 2,374,396, METHOD OF MAKING CHROMIUM-NICKEL AUSTENITIC STAINLESS STEEL, patented April 24, 1945 by Stephen F. Urban, Chicago, Ill.

✦ ✦ ✦

The method comprises dissolving nickel-oxide in a molten carbon-containing ferrous charge in an electric induction furnace under conditions reducing the carbon of the charge to a content sufficiently low to permit the subsequent addition of the ferro alloys necessary to produce this type from the charge without raising its carbon content above .030%, and subsequently deoxidizing the charge and adjusting its composition to produce the type of steel of the analysis desired and not more than a .030% carbon content.

✦ ✦ ✦

No. 2,374,520, COILING MACHINE AND METHOD OF COILING RODS, patented April 24, 1945 by Andrew J. Anderson, Minneapolis, Minn.

✦ ✦ ✦

In the manufacture of cork screws and the like, a mandrel is given a rotative and forward movement, then stopped, and withdrawn without reverse rotation.

✦ ✦ ✦

No. 2,374,565, RUST PREVENTIVE COMPOSITIONS, patented April 24, 1945 by Harry Roden, Port Neches, Tex., assignor, by mesne assignments, to The Texas Company, New York, N. Y., a corporation of Delaware.

✦ ✦ ✦

This composition comprises Petrolatum (150-165° F.M.P.) 0-15 per cent; cylinder stock 10-25 per cent; viscous pale oil 5-15 per cent; wool fat 1-8 per cent; heavy metal salt of a high molecular weight fatty acid 0.4-1.0 per cent; alkyl ester of a high molecular weight fatty acid 1-5 per cent.

✦ ✦ ✦

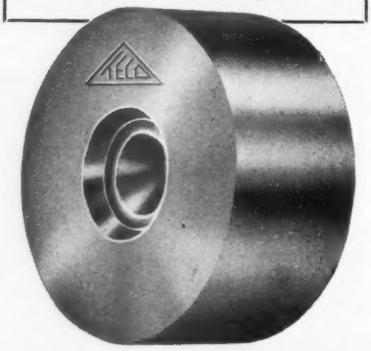
No. 2,374,634, METHOD FOR HARDENING STEELS, patented April 24, 1945 by Raymond S. Wile, Flushing, N. Y., assignor to Induction Heating Corp., New York, N. Y., a corporation of New York.

✦ ✦ ✦

The method consists of coating the surface of the steel with an adhering mix-

TECO CEMENTED CARBIDE

WIRE and BAR DIES • SIZING DIES
EXTRUDING DIES • TUBING DIES
Carbide Blanks, Tools, Bits,
Reamers, Broaches, Forming Tools



PROVE IT YOURSELF! Put TECO Cemented Carbide on any machine in place of present carbide dies. Run exactly as before — then compare the extra production with former results.

TECO Cemented Carbide is extremely hard, dense and uniform — resists wear and pitting beyond any other carbide. And because it does a lot more work, it costs much less to use. Make your on-the-job comparison now. Have one of our engineers discuss your needs — or send details of your operation.

TUNGSTEN ELECTRIC CORPORATION — 564 39th St., Union City, N. J.
Branch Office: 2906 Euclid Avenue, Cleveland, Ohio
Representative: Architects & Builders Bldg., Indianapolis, Ind.

TECO — Pioneers in Tungsten Carbides for over a Quarter Century — CARBIDE DIES

ture comprising substantial amounts of oil and finely divided graphitic material, then rapidly heating to hardening temperature by electromagnetic induction in the presence of air, whereby a resulting coating of the graphitic particles formed on the steel protects the alloying metals in the surface thereof against oxidation during such heating.

✦ ✦ ✦

No. 2,374,274, PARACHUTE PACK FRAME AND THE LIKE, patented April 24, 1945 by Clarence N. Eoff, Detroit, Mich., assignor to L. A. Young Spring and Wire Corporation, Detroit, Mich., a corporation of Michigan.

✦ ✦ ✦

Much of the frame structure is of wire or rod stock.

✦ ✦ ✦

Guide to Wage-Salary Control Now Available

A NEW book, published by the **Bureau of National Affairs, Inc.,** Washington, D. C. is now ready. It is entitled "Wartime Wage Control and Dispute Settlement"; it contains 576 pages and is priced at $6.75 per copy.

✦ ✦ ✦

HERE, for the first time, all regulations relating to wage-salary stabilization have been collected into a single volume for reference use. You will find the laws, the rules, the procedures, the penalties, the interpretations, the forms, the descriptions and standards, the rights of appeal, exactly as set forth by the seven regulatory agencies. The organization of the volume and its convenient indexing system make the law on any particular point extremely easy to locate.

✦ ✦ ✦

REFERENCE material in the book has been catalogued under the proper administrating agency. Included are the federal legislation itself, all executive orders issued by the President, regulations and directives of the Office of Economic Stabilization, procedures and rulings of the War Labor Board and the Internal Revenue Department's Salary Stabilization Unit, plus related wage-price measures of the OPA and the War Food Administration.

✦ ✦ ✦

THE volume is designed for use as a desk manual for the checking of wage and salary plans and policies in the formation stage. Applied to each case as it comes up, the book should help one to avoid inadvertent violations, to establish wage and incentive programs that will win approval, to prepare the necessary forms without the risk of error, and to end a constant waste of time and worry.

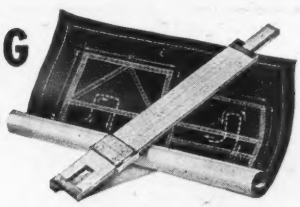
✦ ✦ ✦

AS an extra feature, the book also includes the WLB rules and procedures for the settlement of wartime disputes. It covers WLB authority in dispute cases, describes the use of grievance machinery, shows how the Board operates nationally and regionally and interprets maintenance-of-membership and other requirements.

✦ ✦ ✦

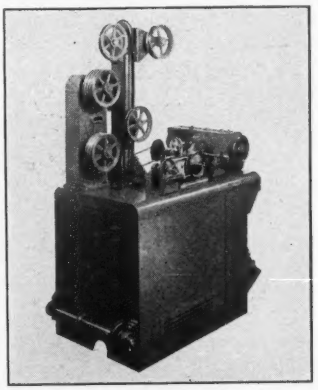
THE book has been prepared by the editorial staff of The Bureau of National Affairs, Inc., in the nation's capital. This same staff publishes informational reports on labor relations subjects and thus has been in first-hand daily contact with the topic undertaken here. Copies may be obtained by writing to the Bureau at 24th and N Streets, N. W., Washington 7, D. C.

OVEN ENGINEERING NEWS



Speed Increased, Finish Improved, Attendant Labor Cut to Minimum By IOE Cable Lacquering System

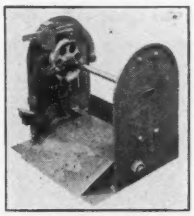
IOE coating and impregnating systems have brought about a decided improvement in the standards of the industry, producing beautifully finished wire with greater dielectric

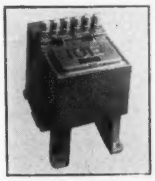


strength and cross-sectional accuracy, 3 to 5 times faster than ever before. Each **IOE** unit is compact and easy to operate, with readily accessible lacquer and saturation pots, quickly changed unwind stands and high-speed constant-tension takeups. Result: under normal conditions *one man can handle an 8-end system producing 48,000 lineal feet of medium size cable per hour!*

Takeup Units—High-speed constant-tension takeups (above), complete and self-contained, are made in standard sizes with a wide range of speed and tension.

Payoff Stands — Payoff stands (right) are equally efficient, affording controlled tension at all times and thereby eliminating backlash.





Lacquer Pots—**IOE** lacquer pots (left) are designed for single- or multi-pass lacquering, and are made of cast aluminum or iron in three standard sizes. Their use assures 100 percent coverage of braid.

Saturation Pots—Saturation pots for any immersion time from 3 to 50 seconds are included in all **IOE** systems.

Drying Tower—Principal unit of the system is a highly efficient explosion-proof vertical oven, designed to produce an extremely high gloss finish with absolute safety. It can be heated by electricity, gas, oil or steam, and maximum recirculation of atmospheres is attained despite extreme volatility of impregnants and lacquers.

Note: IOE lacquer systems are also applicable to finishing of coated cords, fishlines, tapes, coated filaments and fibres.

GET COMPLETE DATA
For full information, send for a free copy of "Lacquering of Insulated Wire and Cable."

(This is No. 16 of a series. Reprints of previous advertisements will be sent free upon request.)

ENGINEERING VERSATILITY

THE INDUSTRIAL *Oven Engineering* COMPANY
11621 DETROIT AVE., CLEVELAND 2, OHIO
Engineering Representatives in Principal Industrial Areas

★ ASSOCIATED COMPANY: JAMES DAY MACHINERY LTD., LONDON, W. 1, ENGLAND ★

Outstanding Personalities of the Wire Industry

Cowlin Made Manager of Eaton Plant at Massillon

E. D. Cowlin has been appointed Resident Manager of the **Reliance Division** of the **Eaton Manufacturing Company,** Massillon, Ohio, and will assume local supervision of Manufacturing and Sales Operations as well as all of the activities in connection with the conduct of the Reliance Division's local operations in Massillon.

✦ ✦ ✦

HE is in his 21st year of service with the company and was originally in charge of the New York Office as New York Manager. In 1930 he was transferred to the Massillon Office as General Sales Manager. Mr. Cowlin is a past president of the National Railway Appliance Association and at present is chairman of the Relations Committee of the Board of Directors; He is a member of the American Railway Engineering Association. The National Federation of Sales Executives, The Society of Mechanical Engineers, The Canadian Railroad Club, The Farm Implement Auxiliary and the Wire Association.

A FAR CRY SINCE THE 14TH CENTURY

Wire was originally made by beating the metal out into plates, which were then cut into continuous strips, and afterwards rounded by beating.

BUT WIRE TODAY IS ONLY AS DEPENDABLE AS ITS MAKER

At Wickwire Brothers Mills in Cortland we begin by making our own steel.

We draw the wire to rigid specifications on modern machines. Many of our own special processes are used—you get over 70 years of knowledge and experience built into our products.

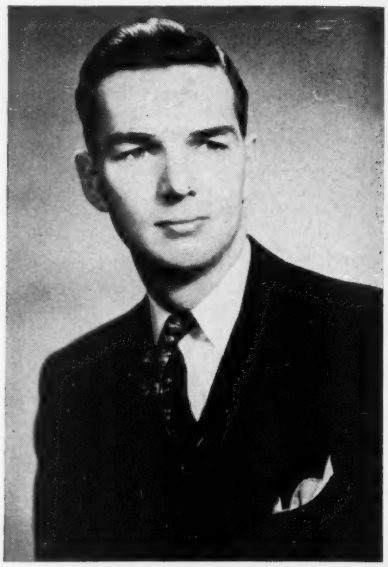
WIRE, plain, galvanized, coppered, tinned, in coils, on spools or straightened and cut to length—in all sizes.

WICKWIRE BROS., INC.
CORTLAND, N. Y.

SPECIFY CORTLAND BRAND WIRE

Havens Appointed Wickwire Spencer Tungsten Engineer

THE **Wickwire Spencer Metallurgical Corporation,** subsidiary of Wickwire Spencer Steel Company, has announced the appointment of **Mr. Theodore A. Havens, Jr.** as Tungsten Engineer.



THEODORE A. HAVENS, JR.

IN his new position with the Wickwire Spencer Metallurgical Corporation, he will be in charge of all tungsten manufacturing, research and development, from raw material to finished product.

✦ ✦ ✦

THE company specializes in finely drawn molybdenum and tungsten wire for the electronic industry and is currently operating at capacity.

✦ ✦ ✦

MR. Havens will be located at the company's plant, 260 Sherman Avenue, Newark 5, New Jersey.

✦ ✦ ✦

Roebling Announces New Appointments

ERNEST C. Low, general manager of sales of **John A. Roebling's Sons Company,** Trenton, N. J., who has been associated with the company since 1910, has been named vice president in charge of sales: **John D. Thompson,** works manager, who has been with Roebling's since 1940, be-

comes vice president in charge of production; and **Charles M. Jones,** manager of engineering and connected with the Roebling organization since 1926, is now vice president in charge of engineering. **Archibald W. Brown,** treasurer of Roebling's and with the company since 1902, has been elected a member of the Board of Directors.

✦ ✦ ✦

OTHER officers of the company are **Lt. Joseph M. Roebling,** who is chairman of the Board; **Charles Roebling Tyson,** president; **Lt. Col. Ferdinand W. Roebling, III,** vice president; and **Herbert D. Rathbun,** secretary.

✦ ✦ ✦

Callite Appoints Larry Halleran Sales Manager of Wire Division

LAWRENCE Halleran, until recently assistant supervisor of the Alloy Wire Mill of Callite Tungsten Corporation, now becomes Sales Manager of the Wire Division of that company, succeeding Harold M. Malm, who has resigned to join Little Falls Alloys, Inc. of West Paterson, N. J., in an executive capacity.

✦ ✦ ✦

MR. Halleran's many years of experience in the manufacture of precision-diameter wires and other Callite specialties will be of value in rendering service to engineers and purchasers of these products.

✦ ✦ ✦

Colonel Larner Named Assistant to President of H. K. Porter Co., Inc.

COL. G. deFreest Larner has been appointed assistant to the president of **H. K. Porter Company, Inc.,** it was announced here by **T. M. Evans,** president.

✦ ✦ ✦

COLONEL Larner will be in charge of war contract termination, renegotiation and tax problems. He was formerly a deputy administrator of the N.R.A. and served as adviser to the Harriman Mission in London before the United States entered the war. He recently returned to inactive status after serving more than three years with the Army Air Forces.

William R. Webster

WILLIAM R. Webster, chairman of the board of the Bridgeport Brass Company, died April 28th. His age was 77. He had arrived earlier in the day to accompany his wife, Mrs. Susan Hinckley Webster, who had been under treatment here, to their home in Bridgeport.

✦ ✦ ✦

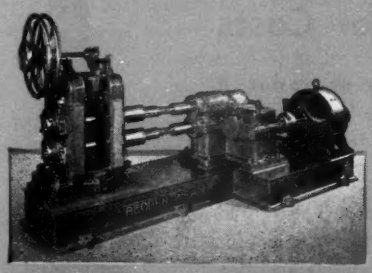
BESIDES his widow, he leaves a daughter, Mrs. Pendleton Marshall, and son, William R. Webster, Jr., both of Bridgeport.

✦ ✦ ✦

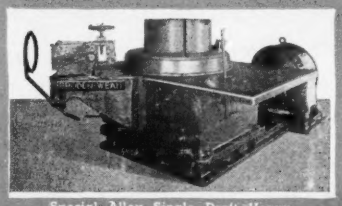
BORN in Oyster Bay, L. I., Mr. Webster was graduated from Cornell University in 1890 as a mechanical engineer, and soon afterward entered the employ of Westinghouse, Church, Kerr & Company. He was an engineer with the Aluminum Brass & Bronze Company of Bridgeport, 1892-93, and superintendent of the Bridgeport Copper Company, 1893-97. From 1897 until his death he was with the Bridgeport Brass Company, becoming chairman of the board in 1930.

(Please turn to page 440)

WEAN-BRODEN



Small Cold Rolling Strip Mill



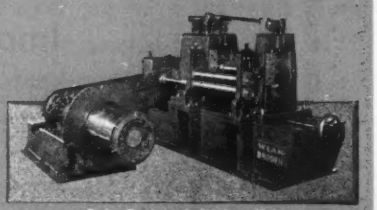
Special Alloy Single Draft Heavy Duty Vertical Wire Drawing Block for ⅛" Round Wire

THE Wean Engineering Company, Inc., have long been recognized as specialists in sheet, strip and tin mill equipment . . . The Broden Construction Company specializes in the manufacture of narrow strip and wire mill equipment.

With the extended facilities of The Broden Construction Company as a subsidiary of The Wean Engineering Company, Inc., it is now possible to serve the steel industry more effectively.

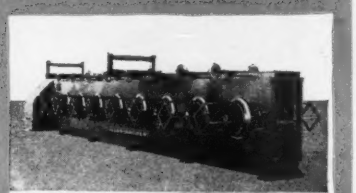
COLD ROLLING MACHINERY
For 36" Wide Material and Narrower
Mills • Reels • Slitters • Levelers • Coilers
Edgers • Scale Breakers • Shears
Scrap Ballers • Continuous Pickling

WIRE MILL EQUIPMENT
Wire Drawing Machines • Patenting
Galvanizing and Tinning Take-Up Frames
Wire Flattening • Spoolers • Nail
Galvanizing and Blueing



Strip Reel and Slitting Unit

HOLMQUIST BARBED WIRE and WIRE FENCE MACHINERY



The BRODEN CONSTRUCTION Co., Inc., Cleveland, O.
A SUBSIDIARY COMPANY OF
The WEAN ENGINEERING Co., Inc., Warren, O.

Outstanding Personalities of the Wire Industry

(Continued from page 439)

R. E. Cramer Appointed Chief Engineer of American Steel & Wire

ROBERT E. Cramer has been named chief engineer of the American Steel & Wire Company, United States Steel Corporation subsidiary, succeeding E. J. Reardon, who recently resigned.

✦ ✦ ✦

MR. Cramer's 35-year association with U. S. Steel subsidiaries began in 1910, when he was employed as a blue print boy at the Schoenberger Works of the American Steel & Wire Company at Pittsburgh, Pa. Several years later, he was transferred to the Carnegie Steel Company as a draftsman, returning to the Schoenberger Works in February, 1916, as assistant steam engineer in the district steam engineering department. He successively was made district engineer at the Pittsburgh office of the Wire company and superintendent of engineering and maintenance at the Donora (Pa.) Steel & Wire Works, before being transferred to the Cleveland office in September, 1941, as a special engineer in the engineering department. In March, 1942, he assumed the position of engineer of appropriations and properties which position he now relinquishes to become chief engineer.

✦ ✦ ✦

H. G. Hilton Elected to Presidency of Steel Company of Canada

ROSS. H. McMaster, president of **The Steel Company of Canada, Limited,** since 1926 and a director since 1914, was appointed chairman of the board of the company at a meeting of its board of directors held in Hamilton on April 23rd, subsequent to the annual general meeting of the shareholders. **H. G. Hilton,** hitherto executive vice president was appointed president of the company.

✦ ✦ ✦

MR. Hilton is authentically a production man. He received his technical education at the Case School of Applied Science in Cleveland graduating in 1910. He entered his career as a steel maker with Pickands Mather and Company at their blast furnace plant in Chicago and held several other blast furnace operating positions in the United States before returning to his native Canada in 1919 to become assistant superintendent of the blast furnaces for The Steel Company of Canada, Limited, in Hamilton, Ontario.

✦ ✦ ✦

HIS rise with this company has been rapid, in succession becoming superintendent of blast furnaces, assistant works manager and in 1934 works manager. Six years ago Mr. Hilton was appointed vice president of the company, appointed a director in 1941 and in 1943 was appointed executive vice president. He now becomes president of the company.

✦ ✦ ✦

IN addition to membership in many Canadian business associations and serving the Canadian Government during these war years as a "dollar a year" man he is also a member of the American Iron and Steel Institute and the American Institute of Mining and Metallurgical Engineers.

Patented

2 BX Mossberg Carrier

MOSSPEED BRAIDER CARRIERS

Represent

Improved Braiding at Lower Costs

The patented MOSSPEED spring tension take-up makes it possible to increase the speed of the maypole-type braiding machine. An effective increase of 80% being obtained in many cases.

The new (x) type MOSSPEED high speed carrier permits the rapid changing of tension springs making this an ideal carrier for braiding all kinds of yarn (cotton, rayon, asbestos, jute), in addition to fine strands of copper wire.

Consult our engineers regarding your braiding problems.

2 SE Copholder

MOSSBERG
Pressed Steel Corp.
18 West Street
Attleboro, Massachusetts, U. S. A.

Complete line of both MOSSPEED carriers and metal copholders for all sizes and makes of maypole type braiding machines.

James Day (Machinery), Ltd., "Ford House," 88 Regent Street, London, W. I., England.

Vote Change in Corporate Title of Westinghouse Electric & Mfg. Co.

STOCKHOLDERS of the **Westinghouse Electric & Manufacturing Company** at their recent annual meeting voted to split the company's stock on the basis of four shares for one and also to change the company's name to **Westinghouse Electric Corporation,** for simplicity and brevity.

✦ ✦ ✦

PURPOSE of the stock split, explained A. W. Robertson, chairman of the company, is to broaden the base of Westinghouse ownership by making the stock available at a lower price.

✦ ✦ ✦

AUTHORIZED capital stock of the company today is 4,000,000 shares, consisting of 80,000 shares of prefered and 3,920,000 shares of common, of which 79,974 shares of preferred and 3,132,816 shares of common are outstanding, all with a par value of $50.00.

✦ ✦ ✦

THE stockholders also elected seven present directors to the sixteenman board. Four were elected for four-year terms. They are: George H. Bucher, president of Westinghouse; W. C. Robinson, president of the National Electric Products Corporation; Authur W. Page, vice president of the American Telephone & Telegraph Company, and Robert T. Swaine, senior member of the law firm of Cravath, Swaine & Moore.

✦ ✦ ✦

H. B. Higgins, president of the Pittsburgh Plate Glass Company, was elected for three years. Named for one-year terms were Gwilym A. Price, Westinghouse vice president, and John R. Read, chairman of the board and president of the Canadian Westinghouse Company.

✦ ✦ ✦

Ralph A. Kent

RALPH A. Kent, 59, superintendent of coke ovens at the Johnstown, Pa., plant of **Bethlehem Steel Company** and long a prominent figure in the industry, died suddenly last Monday in Chicaco. Mr. Kent and a group of Bethlehem departmental superintendents had been on a tour of inspection of coke manufacturing plants.

MR. Kent had been with Bethlehem Steel and its predecessor at Johnstown, Cambria Steel Company, for 45 years, rising to his late post by hard work and perseverance. He was a member of Pittsburgh Chapter, Eastern States Blast Furnace and Coke Ovens Association. He was a native of Bedford, Pa., where he was born September 9, 1885.

✦ ✦ ✦

Chart for Welders Offered

A NEW, invaluable reference chart for welders, which points out the proper shades of filter lenses to wear for different types of welding operations, is announced by the **American Optical Company.** Copies of the chart can be secured free of charge by writing the concern direct at Southbridge, Mass.

✦ ✦ ✦

THE new chart should be in the possession of every welder as it will help simplify and speed up his work in addition to guarding his eye-sight. For example, in exyacetylene torch cutting and welding, the shades of filter lenses are classified according to whether the cutting or welding is light, medium or heavy.

NOW IS THE TIME TO PLAN FOR POST-WAR DISTRIBUTION OF YOUR PRODUCTS TO THE ELECTRICAL DISTRIBUTORS AND ELECTRICAL HARDWARE JOBBERS

If you are new to this market, we have the experience of 25 years as a National Sales Organization, with 18 warehouses and some 50 salesmen, located throughout the U. S., selling exclusively to wholesalers. Will consider a National Distributorship under our own trade name or yours. FINANCIAL references exchanged.

HATHEWAY & COMPANY

75 Montgomery St., Jersey City, 2, N. J.

Wire Manufacturers War Work

DETAILS have now been released of the contribution to the national war effort by the wire rope producing firms in Scotland. Below we give details of the part played by two of the oldest established firms in Scotland.

✦ ✦ ✦

MESSRS. **Brunton, (Musselburgh), Ltd.,** have a long reputation as producers of wire ropes, and they have, since the earliest days of the aeroplane, produced bracing wires for aircraft. During the present war they supplied over 1,000,000 cables with end fittings, and almost 4,000,000 bracing wires, together with 12,000,000 machined repetition parts, to all aircraft of British design in this country. It is known that it was cables made by Bruntons which held the torpedoes to the Fairey Baracudes which dive bombed and sunk the Tirpitz.

✦ ✦ ✦

THE cables produced by the firm ranged in strength from those with a breaking strain of 3cwt to others with a breaking strain of 50 tons, the latter being part of aircraft catapulting gear on ship's decks. They have also made cables for landing jeeps, guns and other stores by parachute, and special non magnetic cables for use in aircraft control columns near the compass.

✦ ✦ ✦

THE firm has used thousands of tons of steel for making guns for the Army, aircraft components for the R.A.F., and many shaped sections for the Admiralty, such as turbine blading and torpedo sections. Special grade spring wire for the springs on anti tank guns, stainless steel rods made to limits of .00025 of an inch for automatic work, dental and surgical instruments, and over 250,000 stainless pins for pistol rockets are among the many items they have supplied.

✦ ✦ ✦

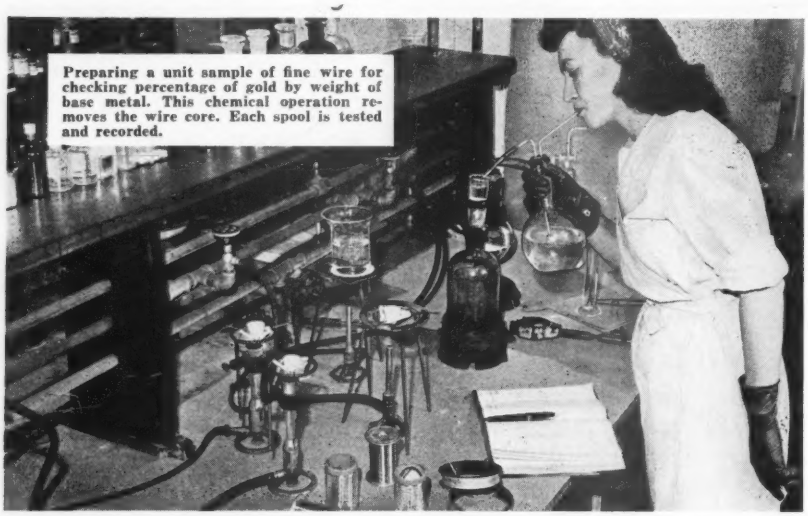
DURING the war period, Bruntons have produced more than 250,000,000 feet of wire rope, the sizes ranging from ¼ of an inch circumference to 9 inch circumference. They were also entrusted with a large programme of wire net construction for anti U-Boat purposes for which special premises were requisitioned. Large salvage ropes were made by them for use in clearing harbours as soon as they were vacated by the enemy.

✦ ✦ ✦

ANOTHER firm of wire rope manufacturers which has been concentrating on vital war requirements over the past few years is the firm of **A. & D. Turner, Ltd.,** Shettleston, Glasgow. Messrs. Turner were approached in 1940 to submit designs for a smooth running hand power winch for storage of wire rope aboard a newly designed ship.

✦ ✦ ✦

THE essence of the design had to be its silence in motion. As a result the firm incorporated in its design the use of Fibroil pinions instead of cast iron and Fedoro linings in the brake section. The design was accepted and the first order for its manufacture was given in January, 1941. It transpired that the craft for which the winches were required were what are now known as L.C.T. craft. Each vessel carried two of these hand power winches, one on the port and the other on the starboard side. The firm's design was incorporated in every L.C.T. ship,



Preparing a unit sample of fine wire for checking percentage of gold by weight of base metal. This chemical operation removes the wire core. Each spool is tested and recorded.

Checking amount of Gold on Clad Wire

The superior quality of **Norelco** gold-clad fine wire is the result of closely-controlled processing techniques and rigid tests that insure precise adherence to all customers' specifications.

As an example, the special cladding equipment designed by our engineers can coat fine wire with percentages of gold by weight ranging from 0.1% to heavy layers with great accuracy. Where tolerances are not specified, the gold coating is made slightly in excess of the percentage called for.

To make sure that tolerances are being maintained, a specimen from each spool is tested for its gold percentage. A unit sample is chemically treated to dissolve the base metal, and the remaining gold weighed on precision scales.

North American Philips manufactures gold-clad fine wire up to .010″ diameter in base metals of silver, tungsten, molybdenum and radio alloys. Also fine wire below .003″ in silver, copper, nickel-chrome, aluminum alloy and other metal alloys.

North American Philips has the knowledge of processes and techniques developed by an organization with a background of over half a century in the electrical field. Call on our specialized engineering service whenever you have a fine-wire problem.

Other Products: In addition to fine wire and diamond dies for our own drawing, we make: Tungsten and Molybdenum products; Quartz Oscillator Plates; Amplifier, Transmitting, Rectifier and Cathode Ray Tubes; Searchray (Industrial X-ray) Equipment; X-ray Diffraction Apparatus; Medical X-ray Equipment, Tubes and Accessories. We invite you to visit our office and showroom when in New York City.

Norelco Reg. U.S. Pat. Off. *Electronic Products by* **NORTH AMERICAN PHILIPS COMPANY, INC.**

Dept. FW-45, 100 East 42nd Street, New York 17, N. Y.
Factories in Dobbs Ferry, N. Y.; Mt. Vernon, N. Y. (Metalix Div.); Lewiston, Me. (Elmet Div.)

and there is not a vessel of this type sailing without two of these winches. They were supplied to the builders in the Clyde, Tyne, Thames, Wear, Aberdeen, Mersey, and Belfast areas, and Messrs. Turner worked on these orders from 1941 right up to D. Day and after, and have turned out several thousands of them.

✦ ✦ ✦

AT the peak of production and for weeks on end before D-Day the equivalent of 30 L.C.T.'s per week were being supplied. One very interesting fact came to light after the firm had supplied many ships, and this fact is looked back on with pride. This winch, while originally designed for the storage of wire ropes, was being used to raise and lower the kedge anchor of the ships.

✦ ✦ ✦

THE kedge anchor at the stern of the vessel is used to take the weight off the vessel when landing on the beaches, and the strain put on the winch, rotating at a speed over ten times that for which it was designed, can be well imagined.

✦ ✦ ✦

THEREUPON strengthening alterations were made, and no failures under working conditions have ever been reported. In view of the many thousands supplied this reflects creditably on the standard of the production. Messrs. Turner were also sole suppliers for the winch for the "Whale" project which, as is now known, was part of the Normandy beaches harbour. They likewise eventually produced all the small reels for storage of cordage rope on the little L.C.A. Craft.

✦ ✦ ✦

Planes Wired for Safety

TO insure greater safety and efficiency on A.A.F. planes, including the B-29, electric power is conveyed to the most vital controls by two or more wires connected in parallel but separately fused and located apart. Thus, if one wire is cut by gunfire, service is not affected.

✦ ✦ ✦

74,000 Turns of Wire in Relay

SEVENTY-FOUR thousand turns of wire, smaller than a strand of human hair, are used on certain coils for telephone switchboard relays.

Issues Literature on Chains and Tubing

THE Youngstown Welding & Engineering Co., Youngstown 9, O., recently published two new bulletins in which our readers may be interested.

✦ ✦ ✦

BULLETIN C145 covers corrosion resistant chains, rings and sling hooks made of monel, iconel, nickel and stainless steel. Complete specifications as to sizes, weights, load factors, etc. are given.

✦ ✦ ✦

BULLETIN T145 is descriptive of tubing, fittings and fabricated piping, which the Company produces in the above and other metals.

✦ ✦ ✦

COPIES of these bulletins are available upon request.

✦ ✦ ✦

Company's Achievements Recognized

THE Hanson-Van Winkle-Munning Company, Matawan, N. J., manufacturers of electroplating equipment and supplies, will receive during this year, a Golden Anniversary Certificate from the National Association of Manufacturers, as a founding company which has been outstanding in contributing to American industrial progress.

WIRE MANUFACTURERS:

Are you interested in a post war yearly business of a half million dollars in rubber and synthetic wire and cables, to be manufactured for us under our own nationally known trade name, and sold by us strictly through wholesalers? References exchanged, and all communications confidential. Reply to Box No. 395 in care of this magazine.

New Catalog Describes Corrosion Resistant Equipment

THE Haveg Corporation, Newark 47, Delaware, in its new Bulletin F-4 describes its complete line of agitators, tanks, cements, pipe, fittings and many other types of equipment used in connection with acids and other corrosive liquids.

✦ ✦ ✦

IT is prepared as a designers' handbook, giving sufficient information to enable an engineer to design complete installations without other references.

✦ ✦ ✦

TABLES and construction drawings give complete details and specifications, making this more than a mere catalog, and it should be most useful to anyone having problems to work out on pickling, cleaning, plating or other jobs.

✦ ✦ ✦

PLEASE write for Bulletin F-4 if a copy is desired.

Bulletin Covers Dry Cyaniding

SURFACE Combustion Corporation, Toledo 1, Ohio, has released a new bulletin, No. SC-124, entitled "Dry Cyaniding in SC Furnaces", which describes and illustrates equipment and metals to be used in this operation. Copies are available upon request to the Company.

The metal trade's established method of drawing rod to triangular, rectangular and special shapes such as keystone, diamond, star and channel forms—both plain and ornamental. "Standard" Turks Heads, universal and plain types, are available in a wide range of capacities.

Write for Catalog T. H.

STANDARD MACHINERY CO.

1545 Elmwood Ave. Providence 7, R. I., U. S. A.

Export Dept.: 1111 South Ferry Bldg., New York 4, N. Y.

1944 Book of A.S.T.M. Standards Published

THE complete new 1944 Book of A.S.T.M. Standards, issued in three parts, contains in their latest approved form all of the Society's widely used specifications and tests for materials. A most important book in connection with the production, purchase and use of materials, the latest edition has 1235 specifications and standard methods which cover more than 6000 pages.

✦ ✦ ✦

ALL specifications, whether formal standards or tentative are given. The Book is issued in three parts, the divisions being as follows:

PART I, METALS—Ferrous and nonferrous metals (all A and B and some E serial designations) except methods of chemical analysis. General testing methods (E serial designations).

PART II, NONMETALLIC MATERIALS — Constructional — Cementitious materials, concrete and aggregates, masonry building units, ceramics, pipe and tile, thermal insulating materials (all C serial designations). Wood and wood preservatives, paints, varnishes and lacquers, road materials, waterproofing and roofing materials, soils (certain D serial designations). General testing methods, thermometers (E serial designations).

PART III, NONMETALLIC MATERIALS — General — Fuels, petroleum products, electrical insulating materials, rubber, textiles, soaps and detergents, paper, plastics, water (remainder of D serial designations). Good testing methods, thermometers (E serial designations).

✦ ✦ ✦

AN innovation in this 1944 Book is the inclusion of all emergency standards and emergency alternate provisions which have been widely used to expedite production and procurement of important materials. (The Society has issued a separate volume on Chemical Analysis of Metals, including standards and recommendations for both ferrous and non-ferrous metals. These methods are not included in the Book of Standards.)

✦ ✦ ✦

EACH part of the 1944 Book has a complete subject index. There are two extensive tables of contents, the first lists all standards under general materials headings; the second according to the serial designations of the standards. The parts are priced at $10 each, and may be bought from the American Society for Testing Materials, 260 South Broad St., Philadelphia 2, Pa.

Firth-Sterling Adds Sizes to Tool Line

TWO announcements to the trade were made by the **Firth-Sterling Steel Company** recently; one, of a number of additional sizes in their line of Firthite General-Purpose Tools, the other in the issuance of a price list on Firthite-Tipped Centers, and the fact that these Centers were now stock items.

✦ ✦ ✦

THE catalog and price list for Firthite General-Purpose Tools is designated as No. FE-121, and covers the ten styles of these tools. In the straight turning tools, five sizes have been added to each of four styles. Four sizes have been added on the line of square-nose tools, while to four styles of the offset turning and boring tools four additional sizes each have been added.

✦ ✦ ✦

THE new price list for Firthite-Tipped Centers — No. FE-122 — shows the complete range of standard sizes carried in three styles — Morse, Brown & Sharpe, or Jarno — of taper. The tips are Firthite sintered-carbide, Grade T-41.

✦ ✦ ✦

New Portable Tube X-Rays Warplane Wings

IN order to examine internal structure of welds, rivets and other vital points of stress in confined spaces such as airplane wings, fuel tanks, etc., **North American Philips Company** recently introduced this new X-ray unit which is now at work in several aircraft plants.

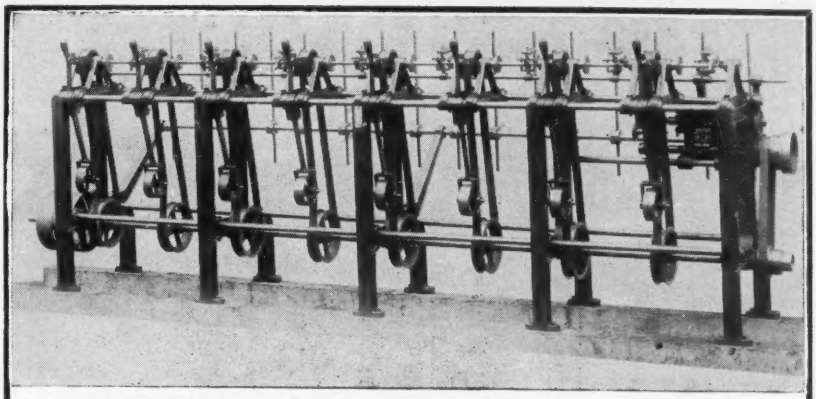
✦ ✦ ✦

THE shockproof tube (approximately 3″ in diameter) is coupled to the generator by means of a shockproof cable and two small water hoses. Water cooling makes possible the compact design so useful for analysis on completed structures.

✦ ✦ ✦

New Catalog Covering Acidproof Cements

THE **Quigley Company**, 527 Fifth Avenue, New York 17, N. Y., has published a bulletin describing Quigley acid-proof cements. If a copy is wanted, please write the Refractories Division, asking for Bulletin A.P.122.



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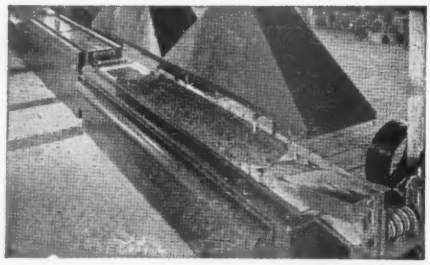

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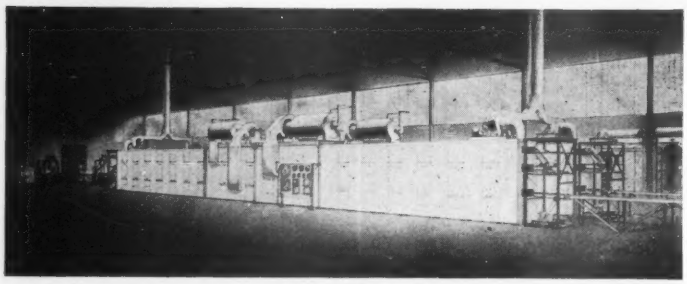

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WRITE for BULLETIN No. 211

THE CARL-MAYER CORPORATION 3030 EUCLID AVENUE CLEVELAND, OHIO

Designs New Cab for Overhead Traveling Cranes

A RADICAL innovation in cab design for overhead traveling cranes has been developed by the **Cleveland Crane & Engineering Co.**, Wickliffe, Ohio, which includes full vision for the operator, comfortable sit-down control and air conditioning.

This revolutionary Cleveland Crane cab is 6′-6″ h'gh by 4′-6″ diameter and equipped with Electric Controller & Manufacturing Co., master switches and Lintern Aire-Rectifier. ✦ ✦ ✦

✦ ✦ ✦

THE cab is the greatest step forward in crane design since the advent of the all-welded steel crane construction also pioneered by Cleveland Crane. Cylindrical in shape it is modern streamlined in appearance. Corners or blind vision spots are eliminated. Ample room is provided with no waste space.

✦ ✦ ✦

THE transparent enclosure panels extend to the floor permitting maximum vision in every direction over the area covered by the crane. The panels are of a new plastic which is shatter proof and impervious to certain gasses common in many plants that may be injurious to glass.

✦ ✦ ✦

WITH this cab, crane operation becomes an easy, sit-down job. Master switches especially designed for magnetic control are located for greatest conveniences. Hoist and trolley switches are attached to the right and left arms of the chair. The bridge switch is on the floor and controlled with the right foot. Thus

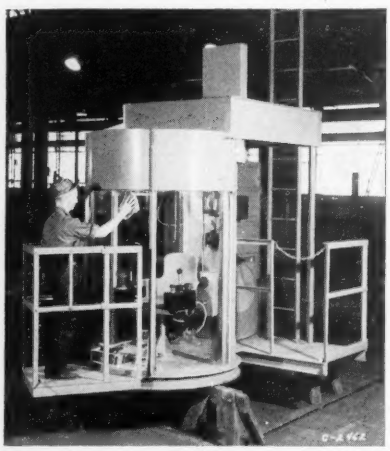
there is a definite control job for each of the operator's hands and feet, but none of his limbs need serve a double duty as in most conventional cabs.

✦ ✦ ✦

AN air-cooled air-conditioning unit, especially designed for this cab provides fresh clean air at any normal temperature desired and gives protection against objectionable gasses, dusts and fumes. The unit attached to the cab illustrated is for use where temperatures do not exceed 140°. Adequate sealing and insulation is provided to assure against excessive losses.

✦ ✦ ✦

A NOVEL feature is the traveling platform which serves both as vestibule to the cab and a means for easy access to the entire exterior side of the window for cleaning purposes. Safety locks on both platform and cab door prevent operation of either except when platform is in proper position.



The traveling platform makes cleaning of the entire window easy and safe. ✦ ✦ ✦

THIS new cab is a self contained unit that may be furnished with any new crane employing magnetic control and it may be applied to existing cranes of any make.

✦ ✦ ✦

Bristol Publishes Folder Describing New Line of Belt Hooks

THE Bristol Company, Mill Supply Division, Waterbury, Conn., announces the publication of a bulletin describing its new line of wire belt hooks for all types of flat belting. This shows methods of applying hooks to belts. Specification information and prices are also given.

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Salt Baths in the Wire Industry

(Continued from page 419)

tenizing and sub-critical transformation, as well as for the transformation time required. These procedures have been clearly explained in numerous metallurgical articles over the past few years by such authors as Bain, Davenport, Babcock, etc.

✦ ✦ ✦

THE same TTT curves may be applied for cyclic annealing, and salt baths should prove just as useful for this form of heat treatment as for hardening and tempering — particularly in the field of wire rods — since successful cyclic annealing is also dependent upon the proper choice of austenizing temperature, sub-critical transformation temperature and time which will yield the soft transformation product best suited for subsequent cold working.

✦ ✦ ✦

A SERIES of articles by Peter Payson includes the upper portions of TTT curves which offer the necessary information for the proper selection of annealing temperatures and procedures for cyclic annealing. Fig. 8 to 12, taken from Mr. Payson's works, have been selected in order to cover a broad range of steels and reveal information of value in selecting the proper cyclic annealing procedure. These curves are illustrative of information which is obtainable for the majority of the commercial grades of steel, including the hardenable stainless alloys. In all cases of cyclic annealing, two salt baths would be required: one maintained at the proper austenizing temperature, and the other to be maintained at the proper temperature for the cycle in the sub-critical range.

✦ ✦ ✦

FOR best wire drawing performances, spheroidal structures are usually desired in annealed rod coming into the wire mill. The production of spheroidal structures depends primarily on the austenizing temperature. In cyclic-annealing as well as in conventional annealing, spheroidization is promoted by low austenizing temperatures—that is, temperatures from 20 to 50 degs. F. above the critical.

✦ ✦ ✦

INFORMATION obtained from available TTT curves would seem to indicate that satisfactory annealing of hot rolled rod can be expeditiously accomplished in salt baths which provide the most rapid heat transfer and heat removal; too, salt baths offer the only heating medium which can give absolute assurance of uniform and accurate treatment of the work itself.

✦ ✦ ✦

SINCE conventional furnace annealing requires exceedingly slow cooling rates — as low as 20 degs. F. per hr.—it would be necessary, for example, in order to secure a yield of 2 tons per hour of annealed wire rods, to build furnaces large enough to anneal 60 tons at a time—assuming a total annealing cycle of only 30 hours. This production could be obtained from an installation of comparatively small salt baths, assuming cyclic annealing requires from 1 to 2 hours for each cycle.

✦ ✦ ✦

Descaling

ANY discussion of the salt bath in the wire industry would be incomplete without mention of its application for descaling operations. Since wire drawing starts from the hot rolled rod which must be either fully annealed or spheroidize annealed prior to wire drawing, all wire coming into the drawing department must be pickled or descaled in order to remove the heavy oxide scale which has formed on the rod's surface in the hot rolling operation. In the case of straight-carbon and low-alloy steels, this is usually accomplished in a simple bath of hydrochloric or sulphuric acid; but, stainless steels present a great deal more difficulty since the oxide surfaces include constituents of chromium and also chromium and nickel oxides — offering stubborn resistance to the action of mineral acids. When pickling of these steels is finally accomplished by use of sulphuric acid, followed by prolonged immersions in the highly corrosive nitric and hydrofluoric acids, the operation is accompanied with a considerable loss of metal due to acid attack of the underlying metal layer. Thus, in the stainless steel grades, losses encountered in pickling the hot rolled and annealed rods often run as high as 2½% metal loss.

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A COMPARATIVELY recent innovation involves the use of salt baths for descaling. Results with specimen work treated in the Experimental Department of Ajax Electric Co., as well as results from a scant half-dozen commercial installations have definitely shown that metal losses in descaling treatment are always under ½ of 1% when work is descaled in salt baths. These baths are composed basically of caustic soda with various addition agents—some of them proprietary in nature. The salt bath descaling process may be outlined as follows:

1. Immersion in the caustic-base salt bath for about 10 minutes in the range of 750 to 925 degs. F.
2. Water rinse.
3. A short dip of not over 30 seconds in warm dilute hydrochloric acid, followed by a second dip, which in the case of straight chrome consists of a 10% nitric acid solution maintained at about 125 degs. F., while in the case of the austenitic chromium nickel grades, the second dip consists of a bath of nitric and hydrofluoric acids maintained at about 140 degs. F., followed by water rinse.

✦ ✦ ✦

THROUGH use of this practice, the descaling is not only thoroughly and easily accomplished without any of the flaws attendant upon the straight mineral acid processes such as surface pitting, incomplete removal of scale, etc., but is also accomplished with a saving of at least 1% of the metal itself.

✦ ✦ ✦

Summary

FOR reasons apparent from the foregoing material, the heretofore justifiable skepticism of wire men on salt bath equipment has been substantially allayed if not, as in many instances today, transposed to enthusiastic support. The three typical examples cited are factual background upon which metallurgical insight is directed to the topic of Cyclic Annealing as well as lending credence to what promises to be expansive use of salt baths in stainless Descaling.

✦ ✦ ✦

LIQUID bath equipment, figuratively speaking, made entry into the wire processing field "on the wrong foot" and the route to favorable acceptance has not been without accompanying technological improvements in furnace characteristics. In contrast to previous exorbitantly

(Please turn to page 450)

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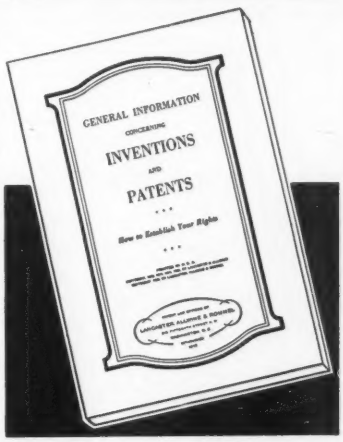

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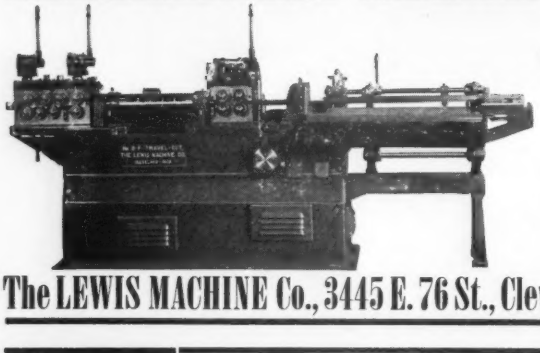
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Salt Baths in the Wire Industry

(Continued from page 449)

high costs of special salts, which spawned the unsound use of evaporators for salt recovery from the water quench, standard salts are available today from numerous sources at reasonable prices. Such attempts to reclaim salt were futile and, moreover, expensive—not only in the initial cost of the auxiliary apparatus, but also in operation since the cost of BTUs required for water extraction overbalanced the value of recovered salt.

✦ ✦ ✦

NEWER electrode designs, utilizing improved alloys of much smaller cross section, reduced metal losses of electrodes and greatly expanded their operating life; while close spacing between electrodes assured temperatures throughout the bath within 5 degs. F. due to electromagnetic circulation. Too, simplification of starting molten baths resulted from the immersed-electrode principle of melting from the top down—thus eliminating the use of auxiliary heating elements and the harmful stresses set up by melting which began below the solidified salt line.

✦ ✦ ✦

POTS, previously limited in range of applications because of their metallic construction, can now be built in any size or shape from refractory material, thus opening the field of higher annealing temperatures (as in stainless steels). Many refractory pots in the wire industry have been in operation for more than 3 years and show no appreciable wear. In fact, advances such as these have made it possible for many salt bath installations to be completely conveyorized—wherein work is automatically processed through a continuous series of operations, assuring product uniformity and maximum output with the least amount of labor. The number of successful installations already made in the wire industry is indicative of even wider application of modern salt bath furnaces within the immediate future; indeed, wire men will do well to keep in close contact with developments in this field.

Galvanizing

(Continued from page 427)

THE time required for complete removal of the oxide by the action of the acid itself was recorded.

✦ ✦ ✦

Results

THE average results of three different samples in each test follows:—Temperature of Annealing—1400° F.

Strength of Sulphuric Acid (% by wt.)	Time required to Pickle at Temps. 77F. Min.	105F. Min.	120F. M.-S.	150F. M.-S.	180F. M.-S.
1	80	24	14	8	2-30
2	45	15	8	4-30	1-30
3	40	15	5	4	1-30
4	35	14	6	3	1-15
5	30	13	4	3-30	1-15
6	28	12	5	3	1-15
7	25	11	4	3	1-15
8	22	12	4	2-30	1-15
9	20	12	4	2-30	1-15
10	20	11	5	2-30	1-10
11	20	11	5	2	1
12	20	9	5	2	1
13	18	8	5	2	0-55
14	16	8	4	2	0-45
15	15	8	4	1-30	0-45
20	9	7	5	1-30	0-30
25	8	6	4	1-30	0-25
30	12	7	4	1-30	0-20
40	13	6	5-30	2	1
50	30	18	17	25	8

✦ ✦ ✦

Conclusion

AT 77 degrees F. the acid concentrations requiring the least time for pickling are between 20-40 per cent. These concentrations pickle in 13 minutes or lower. The 25 per cent solution at this temperature pickles in the quickest time which is 8 minutes. The 50 per cent acid gave a rapid rise in the time of pickling increasing from 13 minutes at 40 per cent to 30 minutes at 50 per cent strength.

✦ ✦ ✦

AT 105 degrees F. the acid concentrations requiring the least time are those between 12 and 40 per cent which require 9 minutes or less for pickling.

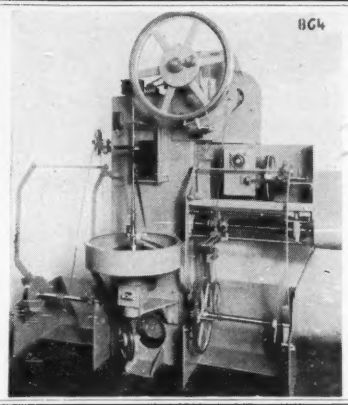
✦ ✦ ✦

THE 25 per cent solution again pickles in the least time which is 6 minutes. With 50 per cent acid the time of pickling increases to 18 minutes.

✦ ✦ ✦

AT 120 degrees F. the best concentration appears to be between 8 and 30 per cent. The time of pickling being 5 minutes or lower. The best

(Please turn to page 452)



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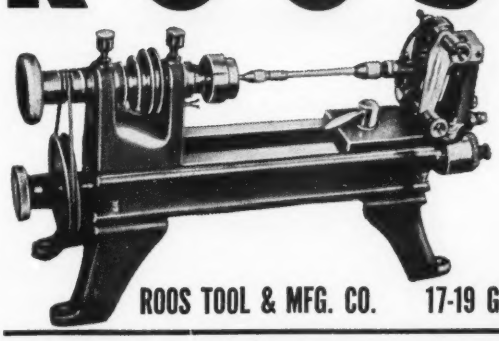

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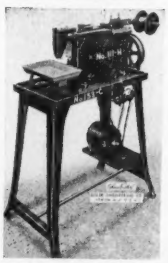

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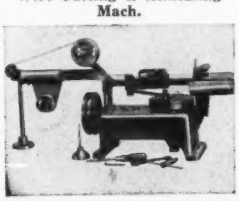

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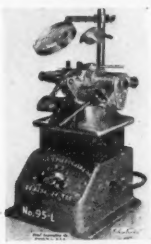

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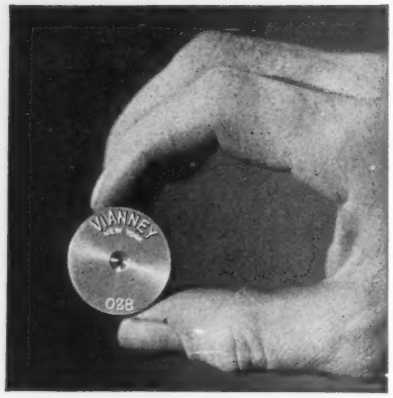

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Galvanizing

(Continued from page 452)

practical concentration at this temperature appears to be about 5 per cent which requires 4 minutes time for pickling. Above 30 per cent concentration the time of pickling begins to increase.

✦ ✦ ✦

AT 150 degrees F. the most rapid acting concentrations are from 4-40 per cent inclusive, all of which pickle in 3½ minutes or less. With concentrations above 30 per cent a black scum was left on the sheets.

✦ ✦ ✦

AT 180 degrees F. the time for pickling at all concentrations was 2½ minutes or lower except in the 50 per cent concentration where the time required for pickling greatly increased as was the case with all other concentrations. At 30 per cent and higher concentrations scumming occurred as at 150 degrees F. Much fuming accurred at all concentrations at this temperature which rendered such temperature undesirable.

✦ ✦ ✦

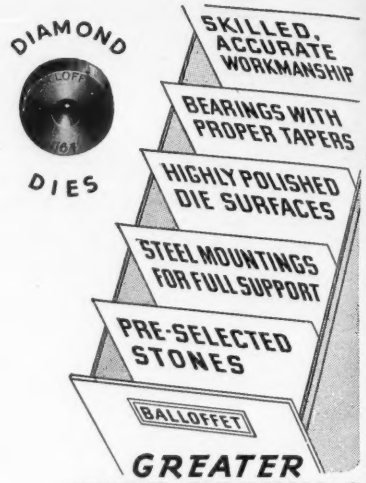
THE time required for pickling at all concentrations of 40 per cent or lower is rapidly diminished with increase in temperature especially up to 120 degrees F.

✦ ✦ ✦

THE time of pickling is accelerated much more by rise in temperature than by increase in acid concentration, i.e. at 120 degrees F. 5 per cent acid pickles just as rapidly at all concentrations up through 30 per cent, whereas at room temperature only between 20-25 per cent acid concentration is there any proximity in pickling time.

✦ ✦ ✦

THE increased time of pickling above 40 per cent acid strength is due to the decreased ionization and probably partially due also to the oxidizing effect of the hot concentrated sulphuric acid both of which retard the solution of iron and the formation of hydrogen gas which forces the scale off the plate. That the hot concentrated acid has an oxidizing effect is shown by the change of color of the scale to a bright red in the 40 to 50 per cent concentration at 180 degrees F.



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THE acids above 30 per cent concentration at 150 and 180 degrees F. left a scum on the ware which is objectionable, so that a more diluted acid is desirable for pickling.

✦ ✦ ✦

THE best temperature for the most rapid and practical pickling appears to be between 120-150 degrees F. Below 120 degrees the time of pickling is greatly increased and at 180 degrees the fumes are excessive.

✦ ✦ ✦

THE best, most practical and most economical concentration appears to be 5 per cent sulphuric acid from 120-150 degrees F.

✦ ✦ ✦

FLIGHT fluctuations on the curves in the time required for pickling need not be considered seriously since the end point is not very sharp.

✦ ✦ ✦

THE loss in weight of sheets in the acid showed that pickling time increased more with the per cent of steel dissolved than it did with increase of acid concentration, e.g. sheets at 77 degrees F. lost 3.2 per cent by weight with 1 per cent acid requiring 80 minutes; at 6 per cent acid concentration and 28 minutes time, the loss was 2.5 per cent; at 10 per cent acid concentration and 20 minutes time, the loss in weight was 2.1 per cent.

✦ ✦ ✦

A TEST showed that a piece of steel which has been annealed four times required 10 per cent more time to pickle at room temperature after the fourth annealing than it did to pickle the same after the first annealing.

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✦ ✦ ✦

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THE Eutectic Welding Alloys Company, 40 Worth Street, New York 13, New York, manufacturers of EUTECTIC Low Temperature Welding Rods, has introduced an unusual new electrode for arc welding. Known as EutecTrode 28, the new electrode is a coated special bronze alloy to be used for the arc welding of bronze, brass, and copper.

✦ ✦ ✦

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✦ ✦ ✦

A PROCEDURE sheet on the proper use and application of EutecTrode 28, and a photograph of a welding job done with EutecTrode 28 are available, upon request.

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✦ ✦ ✦

AT the same time, it was estimated that during the past two years the accident rate at the plant had been reduced by 52%, lost time cases had been cut by 42%, and cases of injury or impairment had been slashed by 31%. The plant worked 35,000,000 man-hours, or the equivalent of a normal three-year period without a fatality.

✦ ✦ ✦

"THIS striking reduction in the accident rate," Mr. Fixler said, "is traceable in large part to the work of the Shop Safety Committee, and the union's advisory Divisional Safety Committee, working in conjunction with the management. The modern medical facilities established at the plant two years ago have been an important factor in reducing the infection rate and the number of lost time cases due to prompt and effective treatment of the injured."

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Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUTTING TOOLS—Carbide
Carboloy Co., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Vascoloy-Ramet Corp., North Chicago, Ill.

CUTTING TOOLS—Wire
Porter, H. K., Inc., Everett, Mass.

DIAMONDS—Industrial
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vianney Wire Die Wks., New York, N. Y.

DIAMOND POWDERS—
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.

DIAMOND TOOLS—
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.

DIES—Diamond
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Cochaud Wire Die Corp., New York, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Luginbill Wire Die Co., Fort Wayne, Ind.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
United Die Co., Newark, N. J.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Wopis Industry Laboratory, Brooklyn, N. Y.

DIES—Lead Extrusion
Carb-Tung Products, Inc., Brooklyn, N. Y.
Robertson, John, Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies Co., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carbide Die Works, Inc., Hartford, Conn.
Carboloy Co., Inc., Detroit, Mich.
Cochaud Wire Die Corp., New York, N. Y.
Carb-Tung Products, Inc., Brooklyn, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Hartley Wire Die, Thomaston, Conn.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Luginbill Wire Die Co., Fort Wayne, Ind.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
United Die Co., Newark, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Rod and Tube Drawing
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carbide Die Works, Hartford, Conn.
Carboloy Co., Inc., Detroit, Mich.
Carb-Tung Products, Inc., Brooklyn, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Hartley Wire Die, Thomaston, Conn.
Kelly Wire Die Corp., New York, N. Y.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Tungsten Electric Corp., Union City, N. J.
United Die Co., Newark, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.
Wopis Industry Laboratory, Brooklyn, N.Y.

DIES—Tantalum Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carbide Die Works, Hartford, Conn.
Carboloy Co., Inc., Detroit, Mich.
Carb-Tung Products, Inc., Brooklyn, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Hartley Wire Die, Thomaston, Conn.
Kelly Wire Die Corp., New York, N. Y.
Luginbill Wire Die Co., Fort Wayne, Ind.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.
Wopis Industry Laboratory, Brooklyn, N. Y.

DIES—Tungsten Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carbide Die Works, Inc., Hartford, Conn.
Carboloy Co., Inc., Detroit, Mich.
Carb-Tung Products, Inc., Brooklyn, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Hartley Wire Die, Thomaston, Conn.
Kelly Wire Die Corp., New York, N. Y.
Luginbill Wire Die Co., Fort Wayne, Ind.
Michigan Wire Die Works, Detroit, Mich.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Tungsten Electric Corp., Union City, N. J.
United Die Co., Newark, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DRAW BENCHES—
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.
Standard Machinery Co., Providence, R. I.
Vaughn Machinery Co., Cuyahoga Falls, O.

DRUMS—Flange Steel
Hubbard Spool Co., Chicago, Ill.
Stevens Metal Products Co., Niles, Ohio.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

DRYING & PRE-HEATING ROOMS
Carl-Mayer Corp., Cleveland, Ohio.
Industrial Oven Engr. Co., Cleveland, Ohio

DRYING EQUIPMENT
Carl Mayer Corp., Cleveland, Ohio.

ELECTRIC RESISTANCE HEATING
Trauwood Engr. Company, Cleveland, Ohio.

ENGINEERS—Consulting Wire Mill
Lewis, Kenneth B., Worcester, Mass.

EQUIPMENT—Insulation Testing
Davis, R. L., Electric Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FENCES AND FENCING—Wire
Wickwire Spencer Steel Co., New York, N.Y.

FIREBRICK REFRACTORIES—Brick and Cement
The Babcock & Wilcox Co., New York 6, N.Y.

FLUXES—Soldering
American Chemical Paint Co., Ambler, Pa.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin, Wm. M., Co., Pittsburgh, Pa.

WHERE TO BUY, Continued

FRICTION PAY-OFF STANDS—
Industrial Oven Engr. Co., Cleveland, Ohio.

FURNACES—Annealing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engr. Company, Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Automatic
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Brazing
Electric Furnace Co., Salem, Ohio.
Firth-Sterling Steel Co., McKeesport, Pa.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Electric
Eisler Engineering Co., Newark 3, N. J.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engr. Company, Cleveland, Ohio.

FURNACES—Galvanizing Equip.
Electric Furnace Co., Salem, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engineering Co., Cleveland, O.

FURNACES—Hard'ing & Temp'ing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engr. Company, Cleveland, Ohio.

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio.
Robertson, John, Co., Brooklyn, N. Y.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Non-Oxidizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engineering Co., Cleveland, O.

FURNACES—Normalizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., Cleveland, Ohio

FURNACES—Salt Bath
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corporation, Toledo, Ohio.

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio.
Eisler Engineering Co., Newark 3, N. J.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., Cleveland, Ohio
Wilson, Lee, Engr. Co., Cleveland, Ohio.

GALVANIZING KETTLES
National Annealing Box Co., Washington, Penna.

GRINDERS—Roll
Norton Co., Worcester, Mass.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

INSULATING LACQUERING SYSTEMS—Continuous
Industrial Oven Engr. Co., Cleveland, Ohio.

INSULATING MATERIALS—
Angier Sales Corp., Framingham, Mass.
Cheney Bros., New Pork, N. Y.
Crepe-Kraft Co., Newark, N. J.
Dobeckmun, The, Co., Cleveland, Ohio.
DuPont de Nemours, E. I., Wilmington, Ill.
Owens-Corning Foberglas Corp., Toledo, O.

KETTLES—Galvanizing, Annealing, Tinning, etc.
National Annealing Box Co., Washington, Penna.

LATHES—Die Reaming
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Morgan Construction Co., Worcester, Mass.
Roos, H. & G., Tool & Mfg. Co., Montclair, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry & Machine Co., Waterbury, Conn.

LIME—
Warner & Company, Philadelphia and Bellefonte, Pa.

LININGS—Acid and Alkali Proof
Ceilcote Co., The, Cleveland, Ohio.
Haveg Corp., Newark, Del.
Heil Engineering Co., Cleveland, Ohio.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

LUBRICANTS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Robertson, John, Co., Brooklyn, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
Fidelity Machine Co., Philadelphia, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Brazing
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Bunching
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Chain Making
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY— Coilers
Broden Construction Co., Cleveland, Ohio.
Eisler Engineering Co., Newark 3, N. J. (for Tungsten Wire)
Morgan Construction Co., Worcester, Mass.
New England Butt Co., Providence, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Copper Wire Drawing and Rolling
American Insulating Mach'y Co., Phila., Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Cutting
Broden Construction Co., Cleveland, Ohio.
Eisler Engineering Co., Newark 3, N. J.
Lewis Machine Co., The, Cleveland, Ohio.
Moslo Machinery Inc., Cleveland, Ohio.
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Porter, H. K., Inc., Everett, Mass.
Shuster, F. B., Mfg. Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Die Making
Carboloy Co., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Roos, H. & G., Tool & Mfg. Co., Montclair, N. J.

MACHINERY—Draw Benches
Broden Construction Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Edging
Broden Construction Co., Cleveland, Ohio.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Industrial Oven Engineering Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Extruding
Robertson, John, Co., Brooklyn, N. Y.
Royle, John, & Sons, Paterson, N. J.

MACHINERY—Fence
Broden Construction Corp., Cleveland, Ohio
Glader, Wm., Machine Works, Chicago, Ill.

MACHINERY—Filament Coil Winding
Eisler Engineering Co., Newark 3, N. J.

MACHINERY—Flat Wire
Broden Construction Co., Cleveland, Ohio.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY— Forming
Eisler Engineering Co., Newark 3, N. J.
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Galvanizing
Wilson, Lee, Engr. Co., Cleveland, Ohio.

MACHINERY—Galvanizing Wire
Broden Construction Co., Cleveland, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

MACHINERY—Gang Winders
Fidelity Machine Co., Philadelphia, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., Worcester, Mass.

MACHINERY—Insulating
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Philadelphia, Pa.

MACHINERY—Lead Encasing Presses, etc.
Robertson, John, Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
Robertson, John, Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

WHERE TO BUY, Continued

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Material Handling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

MACHINERY—Measuring Wire & Cable
Durant Mfg. Co., Milwaukee, Wis.
Lyon-Vail Machine Co., Brockton, Mass.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Nail and Tack
Broden Construction Co., Cleveland, Ohio.
Glader, Wm., Machine Works, Chicago, Ill.
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Panning
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Pointing
Broden Construction Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Quill Winding
Fidelity Machine Co., Philadelphia, Pa.

MACHINERY—Rod Mill
Broden Construction Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.

MACHINERY—Rolling Mill
Broden Construction Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Rubber for Insulating Wire
Royle, John, & Sons, Paterson, N. J.

MACHINERY—Rubber Tubing and Straining
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Screw Wire
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila., Pa.
Broden Construction Co., Cleveland, Ohio.
Emory, Robert J., Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Nilson, A. H., Machine Co., Bridgeport, Conn.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I. (Special Designs)
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spooling
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark 3, N. J.
Emory, Robert J., Co., Newark, N. J.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spring Making
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Broden Construction Co., Cleveland, Ohio.
Lewis Machine Co., The, Cleveland, Ohio.
Moslo Machinery Co., Cleveland, Ohio.
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Ruesch, H. J., Machine Co., Newark, N. J.
Shuster, F. B., Mfg. Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Stranding
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Construction Co., Cleveland, Ohio.
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Swaging
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Testing Equipment—Sparkers
Davis, R. L., Electric Co., Wallingford, Conn.
Entwistle, Jas. L., Pawtucket, R. I.

MACHINERY—Testing Spring
Standard Machinery Co., Providence, R. I.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co, Torrington, Conn.

MACHINERY—Welding Wire
Eisler Engineering Co., Newark 3, N. J.
Micro Products Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark 3, N. J.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wind-up
Entwistle, Jas. L., Co., Pawtucket, R. I.
Industrial Oven Engr. Co., Cleveland, Ohio.

MACHINERY—Wire Bending
Eisler Engineering Co., Newark 3, N. J.
Nilson, A. H., Co., Bridgeport, Conn.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

MACHINERY—Wire Drawing
American Insulating Mach'y Co., Phila., Pa.
Broden Construction Co., Cleveland, Ohio.
Eisler Engineering Co., Newark 3, N. J.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Wire Measuring
Durant Mfg. Co., Milwaukee, Wis.
Lyon-Vail Machine Co., Inc., Brockton, Mass.
New England Butt Co., Providence, R. I.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Tinning
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Wood Screw
National Machinery Exchange (Used), New York, N. Y.

MATERIAL HANDLING EQUIP.
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

MILLS—Tandem Rolling and Edging
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co, Torrington, Conn.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburg, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Hudson Wire Co., Ossining, N. Y.

OILS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Shell Oil Co., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

OVENS—Cable Lacquering
American Insulating Mach'y Co., Philadelphia, Pa.
Industrial Oven Engr. Co., Cleveland, Ohio.

OVENS—Dehydrogenizing
Carl-Mayer Corp., Cleveland, Ohio.
Industrial Oven Engr. Co., Cleveland, Ohio.

OVENS—Industrial
Carl Mayer Corp., The, Cleveland, Ohio.
Industrial Oven Engr. Co., Cleveland, Ohio.

OVENS—Welding Rod Coating
Carl Mayer Corp., The, Cleveland, Ohio.
Industrial Oven Engr. Co., Cleveland, Ohio.
Moslo Machinery Co., Cleveland, Ohio.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PAINTS—Marine
American Chemical Paint Co., Ambler, Pa.

PAINTS—Structural Steel
American Chemical Paint Co., Ambler, Pa.

PANS—Lead and Spelter
National Annealing Box Co., Washington, Penna.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Creped Wrapping
Crepe-Kraft Co., Newark, N. J.

PAPER—Insulating
Angier Sales Corp., Framingham, Mass.
Crepe-Kraft Co., Newark, N. J.

PAPER TESTERS—
Scott Testers, Inc., Providence, R. I.

PATENT ATTORNEYS—
Lancaster, Allwine and Rommel, Washington, D. C.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

PICKLING TANK LININGS—
Ceilcote Co., The, Cleveland, Ohio.
Haveg Corp., Newark, Del.
Heil Engineering Co., Cleveland, Ohio.
Keagler Brick Co., Steubenville, Ohio.
Sauereisen Cement Co., Pittsburgh, Pa.

PIPES & FITTINGS—Acid Resistant
Ceilcote, The, Co., Cleveland, Ohio
Haveg Corp., Newark, Del.
Heil Engineering Co., Cleveland, Ohio.

PLASTIC TESTERS—
Scott Testers, Inc., Providence, R. I.

POTS—Lacquer
Industrial Oven Engr. Co., Cleveland, Ohio.

POTS—Lead Melting
National Annealing Box Co., Washington, Pa.
Robertson, John, Co., Brooklyn, N. Y.

POWDER—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Homer, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

PRESSES—Hydraulic and Mechanical
Robertson, John, Co., Brooklyn, N. Y.
Standard Machinery Co., Providence, R. I. (Mechanical Only)

PRESSES—Lead
Robertson, John, Co., Brooklyn, N. Y.

PRESSURE VESSELS—
National Annealing Box Co., Washington, Penna.

WHERE TO BUY, Continued

PULLERS—Wire
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
Robertson, John, Co., Brooklyn, N. Y.

REEL AND TENSION STAND—
Fidelity Machine Co., Philadelphia, Pa.
Industrial Oven Engr. Co., Cleveland, O.
Moslo Machinery Co., Cleveland, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS—Annealing and Stranding
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B., Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

REELS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B., Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

REELS AND SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B., Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

REELS—Takeoff
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B., Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

REELS—Traverse
Hubbard Spool Co., Chicago, Ill.
Stevens Metal Products Co., Niles, Ohio.

REELS—Vulcanizing & Impregnating
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B., Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

REELS—Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B., Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

REFRACTORIES—High Temperature
Norton Co., Worcester, Mass.

ROD BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio.

RODS—Wire—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

ROLL STRAIGHTENERS—
Moslo Machinery Co., Cleveland, Ohio.

ROPE—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Brewer Mfg. Co., Muncy, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott Testers, Inc., Providence, R. I.

RUST PROOF COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

RUST REMOVING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

SATURATION SYSTEMS—
Industrial Oven Engr. Co., Cleveland, Ohio.

SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

SHEET—Steel
Continental Steel Corp., Kokomo, Indiana.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.

SOAPS—Industrial and Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Potter, Neil C., Newark, N. J.
Shell Oil Co., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

SOLVENT RESIN SYSTEMS—Experimental
Industrial Oven Engr. Co., Cleveland, Ohio.

SPOOLS—Annealing and Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B., Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

SPOOLS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B., Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

SPRINGS—Steel
Wickwire Spencer Steel Co., New York, N. Y.

STAMPINGS—Steel
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRAND—Steel and Copper
Brewer Mfg. Co., Muncy, Pa.

STRIP—Brass and Non-Ferrous
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.

STRIP METAL TESTERS—
Scott Testers, Inc., Providence, R. I.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.

TANK LININGS—Brick
Ceilcote Co., The, Cleveland, Ohio.
Keagler Brick Co., Steubenville, Ohio.
Nukem Products Corp., Buffalo, N. Y.

TANKS—Pickling
Ceilcote Co., The, Cleveland, Ohio.
Haveg Corp., Newark, Del.
Heil Engineering Co., Cleveland, Ohio.
Nukem Products Corp., Buffalo, N. Y.
Sauereisen Cements Co., Pittsburgh, Pa.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.
National Annealing Box Co., Washington, Pa.

TENSILE TESTERS—
Scott Testers, Inc., Providence, R. I.

TESTING INSTRUMENTS—
Davis, R. L., Electric Co., Wallingford, Conn.
Scott Testers, Inc., Providence, R. I.

TOOLS—Wire Cutting
Porter, H. K., Inc., Everett, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

TRAVERSES—
Hubbard Spool Co., Chicago, Ill.
Stevens Metal Products Co., Niles, Ohio

TREADS—Safety
Norton Co., Worcester, Mass.

TRUCKS—
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

TUBE BENDERS AND FORMERS—
Ruesch, H. J., Machine Co., Newark, N. J.

TURKS HEADS—Friction and Power Driven
Standard Machinery Co., Providence, R. I.

VALVES AND FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark 3, N. J.
Micro Products Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.

WIND-UP AND UNWIND SYSTEMS—Continuous
American Insulating Mach'y Co., Philadelphia, Pa.
Entwistle, James L., Co., Pawtucket, R. I.
Industrial Oven Engr. Co., Cleveland, Ohio.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE—Cold Heading
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A. Sons, Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.

WIRE—Enameled for Coils
North American Philips Corp., Dobbs Ferry, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A. Sons, Co., Trenton, N. J.
Spencer Wire Co., West Brookfield, Mass.
Wickwire Bros., Cortland, N. Y.
Wickwire Spencer Steel Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE—Music
Spencer Wire Co., West Brookfield, Mass.

WIRE—Nickel Silver and Phosphor Bronze
Hudson Wire Co., Ossining, N. Y.
Spencer Wire Co., West Brookfield, Mass.

WIRE—Non-Ferrous to Specification for Special Purposes
Hudson Wire Co., Ossining, N. Y.
North American Philips Corp., Dobbs Ferry, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Spencer Wire Co., West Brookfield, Mass.
Wickwire Spencer Steel Co., New York, N. Y.

WIRE—Stainless Steel
Firth-Sterling Steel Co., McKeesport, Pa.
Spencer Wire Co., West Brookfield, Mass.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A. Sons, Co., Trenton, N. J.
Spencer Wire Co., West Brookfield, Mass.
Wickwire Bros., Cortland, N. Y.
Wickwire Spencer Steel Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE AND STRIP—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE TESTERS—
Scott Testers, Inc., Providence, R. I.

WIRE, WEAVING—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.

WRAPPING PAPER—Creped
Crepe-Kraft Co., Newark, N. J.

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

YARNS AND TAPES—
Cheney Bros., New York, N. Y.
DuPont de Nemours, E. I., Wilmington, Del.
Dobeckmun Co., The, Cleveland, Ohio.
Owens-Corning Fiberglas Corp., Toledo, O.

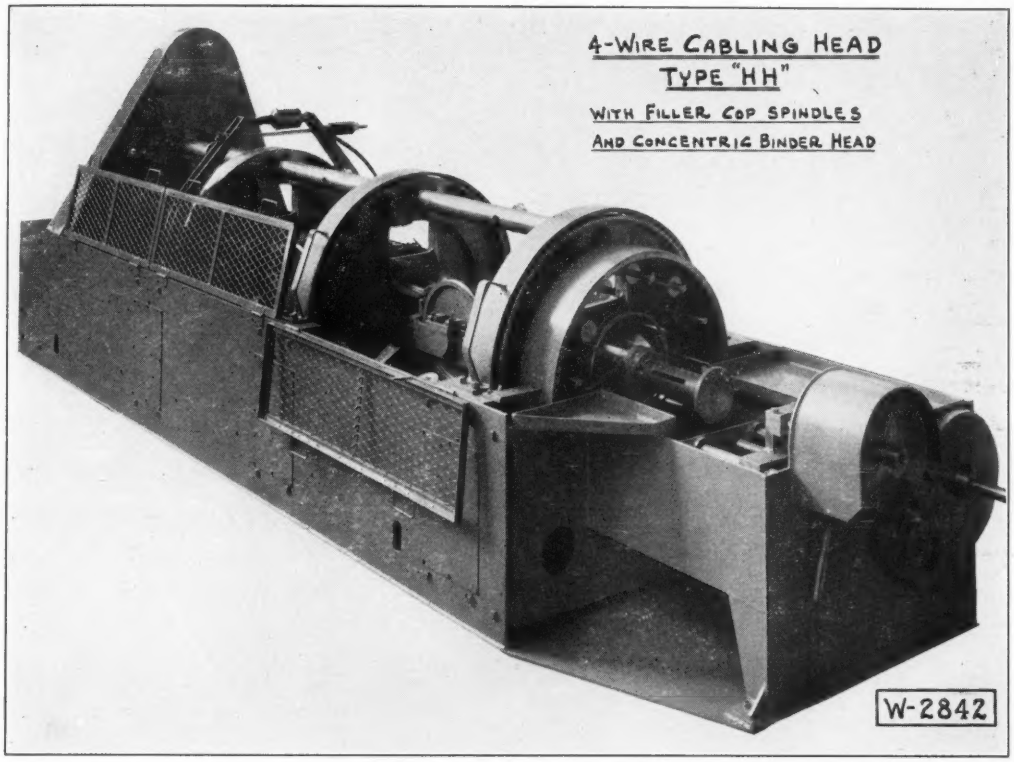
The WATSON MACHINE COMPANY
ESTABLISHED 1845
PATERSON, NEW JERSEY, U. S. A.

Wire & Wire Products
June, 1945

ELECTRICAL WIRE AND CABLE AND WIRE ROPE MACHINERY

CAGE TYPE High Speed CABLING HEADS "HH"

PATENT PENDING



All-Steel, Anti-Friction Bearing, Textolite Supported Rotor, in Rigid Box Frame, with Direct Vee Belt Drive, with Automatic Air Brakes (For Plant Air Supply)

✦ ✦ ✦

Low Lead Angles and Open Construction Facilitates Operator's Functions

✦ ✦ ✦

Filler Cop Spindles on Exit Disc

✦ ✦ ✦

Binder Head After Die If Desired

(Separate Literature)

✦ ✦ ✦

2-Wire Heads (1-spool in Rotor) also available

Head Size No.		10	11	12
STD. SPOOL	Diam. x Traverse	24 x 14	30 x 16	40 x 20
	Barrel x Overall Tip Width	10 x 15½	12 x 18	16 x 23
	Cubic Inch Volume	5240	9500	21100
	Max. Spool + Load Pounds	700	1350	2800
Rated O. Diam. Conductor		5/16″	3/8″	1/2″
3-WIRE HEAD (2 Spool Rotor)	R. P. M.	550	450	300
	Motor H.P./R.P.M.	10/1800	15/1800	20/1200
	Approx. Bare Weight (lbs.)	8000	10200	14100
4-WIRE HEAD (3 Spool Rotor)	R. P. M.	520	420	275
	Motor H.P./R.P.M.	15/1800	20/1200	25/1200
	Approx. Bare Weight (lbs.)	10500	13400	18600
FILLER COPS	Dia. x Lgth. x Spindle	6″x6″x1″	8″x6″x1″	
	Max. Unit Pounds	3	4¾	
	Number of	12	12	

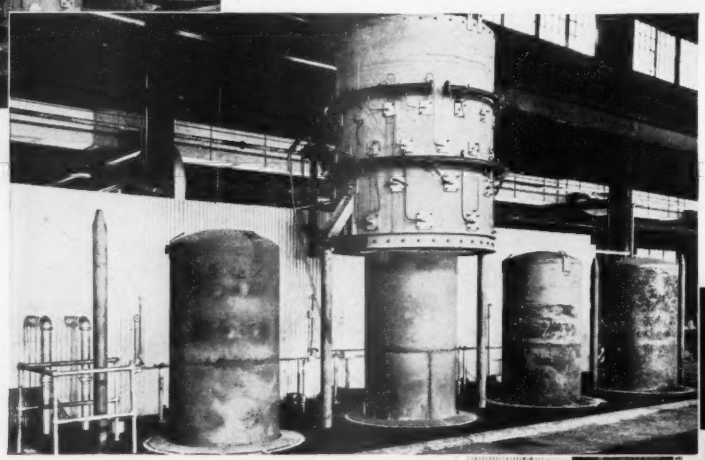
EF FURNACES

For Every Industrial Heat Treating Process

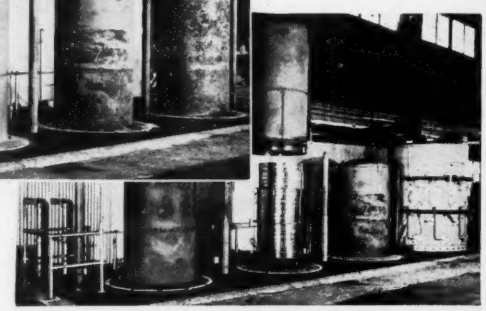
These EF Gas Fired Bell Type Furnaces

Maintain Uniform Temperature Throughout Charge Regardless of the Weight, Size, or Height of Load

(Above) An EF Bell Type Installation consisting of furnace, 4 bases, and retorts.



(Left) Each base accommodates charges up to 22,000 lbs. and coils up to 45" in diameter.



(Right) Removing a retort from base, showing bright annealed charge.

For Annealing Strip, Wire and Other Products

Equipped with special radiant type gas burners and separate automatic temperature control zones, these EF gas fired removable hood type furnaces maintain uniform temperature distribution throughout the entire charge on each and every load, regardless of weight, size or height of load.

The installation shown above was designed for annealing medium and high carbon mirror-finish cold rolled steel strip, and is equipped with special EF gas generator equipment for producing the protective atmosphere for bright annealing without decarburization. Each base accommodates charges up to 22,000 lbs. and handles coils in any width and up to 45" in diameter.

This installation is equipped with a pre-mix plant for mixing the gas and air in proper proportions. This eliminates all manual burner adjustments, as the gas-air mixture is previously obtained in the machine. The high turn down ratio on burners permits use of modulating type control.

This equipment is provided with 4 bases, each with motor driven centrifugal type fan for circulating atmosphere down through the center of the charge and up between the outside of coil and the gas-tight retorts.

An extremely high rate of circulation is obtained and uniform temperature is provided and maintained regardless of the size of charge.

Other types of outstanding EF production furnace installations include furnaces for bright annealing both ferrous and non-ferrous strip, wire, tubing and other products . . . furnaces for the production heat treatment of bolts, springs, castings, stampings, forgings, automotive parts, aircraft and aircraft engine parts, aluminum and magnesium castings, and many other allied products.

Telephone 4661 Salem, Ohio, or write us regarding your furnace requirements. We specialize on building production furnaces—oil fired, gas fired, or electrically heated.

The Electric Furnace Co., Salem, Ohio

Gas-Fired - Oil-Fired and Electric Furnaces---For Any Process, Product or Production